



## **Accelerating the adoption and scale-up of climate-smart transport in Malaysia**

### **Part I: Project Information**

#### **GEF ID**

10739

#### **Project Type**

MSP

#### **Type of Trust Fund**

GET

#### **CBIT/NGI**

CBIT **No**

NGI **No**

#### **Project Title**

Accelerating the adoption and scale-up of climate-smart transport in Malaysia

#### **Countries**

Malaysia

#### **Agency(ies)**

UNIDO

#### **Other Executing Partner(s)**

Ministry of Environment and Water (KASA); Malaysian Green Technology and Climate Change Centre (MGTC)

#### **Executing Partner Type**

Government

#### **GEF Focal Area**

Climate Change

#### **Taxonomy**

Focal Areas, Climate Change, Climate Change Mitigation, Sustainable Urban Systems and Transport, Technology Transfer, Renewable Energy, United Nations Framework Convention on Climate Change, Nationally Determined Contribution, Influencing models, Demonstrate innovative approach, Transform policy and regulatory environments, Stakeholders, Private Sector, Large corporations, SMEs, Capital providers, Communications, Awareness Raising, Education, Beneficiaries, Local Communities, Civil Society, Academia, Non-Governmental Organization, Community Based Organization, Type of Engagement, Consultation, Participation, Partnership, Information Dissemination, Gender Equality, Gender results areas, Capacity Development, Access to benefits and services, Gender Mainstreaming, Gender-sensitive indicators, Sex-disaggregated indicators, Capacity, Knowledge and Research, Knowledge Exchange, Conference, Innovation, Learning, Enabling Activities, Knowledge Generation, Training, Workshop

**Sector**

Transport/Urban

**Rio Markers**

**Climate Change Mitigation**

Climate Change Mitigation 2

**Climate Change Adaptation**

Climate Change Adaptation 0

**Submission Date**

2/9/2022

**Expected Implementation Start**

7/1/2022

**Expected Completion Date**

6/30/2027

**Duration**

60In Months

**Agency Fee(\$)**

168,766.00

**A. FOCAL/NON-FOCAL AREA ELEMENTS**

<b>Objectives/Programs</b>	<b>Focal Area Outcomes</b>	<b>Trust Fund</b>	<b>GEF Amount(\$)</b>	<b>Co-Fin Amount(\$)</b>
CCM-1-2	Promote innovation and technology transfer for sustainable energy breakthroughs for electric drive technologies and electric mobility	GET	1,776,484.00	59,421,928.00
<b>Total Project Cost(\$)</b>			<b>1,776,484.00</b>	<b>59,421,928.00</b>

**B. Project description summary**

**Project Objective**

To enhance the ecosystem in Malaysia for accelerated adoption of electric vehicles and support the implementation of national policy promoting reductions in transport related greenhouse gas emissions.

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
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Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
1. Strengthening the national policy and institutional frameworks into implementation of up-scaling electric mobility adoption and sustainable battery use	Technical Assistance	1.1 Policy environment, institutional and regulatory framework implementation for electric mobility and sustainable battery use enhanced in a gender-responsive manner	<p>1.1.1 Implementation guidelines and standards for smart charging to maximize renewable energy for charging and harmonization of electric vehicle supply equipment.</p> <p>1.1.2 Public transport and freight master plan enhanced based on modelling and scanning of electric drive technology options. At least 1 study on mode shift from road to rail to be produced.</p> <p>1.1.3 Development of electric vehicle and sustainable battery ecosystem and value chain roadmap.</p>	GET	400,000.00	17,131,928.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
2. Investment and commercialization of electric mobility technologies	Investment	2.1 Technology innovation with electric mobility supported and financed	2.1.1 Development of business models and deployment of renewable energy based smart charging.	GET	1,000,000.00	36,794,000.00
			2.1.2 Demonstration of EV battery repurposing and recycling. At least 1 demonstration of battery remanufacturing to be conducted in Cyberjaya.			
			2.1.3 Development of business models and deployment of electric vehicle battery swapping technology integrated with renewable energy.			

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
3. Capacity building and scale-up	Technical Assistance	3.1 Strengthened local knowledge-base and scale-up of electric mobility regionally and internationally	3.1.1 Targeted training for municipal governments and private sector on electrifying fleets, charging infrastructure and sustainable use of batteries	GET	135,000.00	150,000.00
			3.1.2 Training / workshops supporting development of electric vehicle and sustainable battery ecosystem and value chain with a focus on women participation			
			3.1.3 Knowledge exchange and scale-up through participation in regional and international platforms			

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
4. Monitoring and evaluation	Technical Assistance	4.1 Project achieves objective through effective monitoring and evaluation	4.1.1 Monitoring and mid-term review  4.1.2 Project terminal evaluation	GET	79,986.00	100,000.00
Sub Total (\$)					1,614,986.00	54,175,928.00
<b>Project Management Cost (PMC)</b>						
GET		161,498.00		5,246,000.00		
Sub Total(\$)		161,498.00		5,246,000.00		
Total Project Cost(\$)		1,776,484.00		59,421,928.00		

Please provide justification

**C. Sources of Co-financing for the Project by name and by type**

<b>Sources of Co-financing</b>	<b>Name of Co-financier</b>	<b>Type of Co-financing</b>	<b>Investment Mobilized</b>	<b>Amount(\$)</b>
GEF Agency	United Nations Industrial Development Organization (UNIDO)	Grant	Investment mobilized	50,000.00
GEF Agency	United Nations Industrial Development Organization (UNIDO)	In-kind	Recurrent expenditures	150,000.00
Recipient Country Government	Ministry of Environment and Water (KASA)	Grant	Investment mobilized	401,912.00
Recipient Country Government	Ministry of Environment and Water (KASA)	In-kind	Recurrent expenditures	329,016.00
Recipient Country Government	Malaysia Green Technology and Climate Change Corporation (MGTC)	In-kind	Recurrent expenditures	850,000.00
Recipient Country Government	Green Technology Financing Scheme (Danajamin Nasional Berhad)	Guarantee	Investment mobilized	10,165,000.00
Recipient Country Government	Malaysia Automotive, Robotics and IoT Institute (MARii)	Public Investment	Investment mobilized	4,950,000.00
Recipient Country Government	Ministry of Transport (MOT)	Public Investment	Investment mobilized	15,600,000.00
Recipient Country Government	Iskandar Regional Development Authority (IRDA)	Public Investment	Investment mobilized	20,250,000.00
Recipient Country Government	Iskandar Regional Development Authority (IRDA)	In-kind	Recurrent expenditures	290,000.00

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount(\$)
Private Sector	Henz Pacific Sdn Bhd	Equity	Investment mobilized	6,150,000.00
Private Sector	Perusahaan Otomobil Nasional SDN. BHD (PROTON)	In-kind	Recurrent expenditures	236,000.00
<b>Total Co-Financing(\$)</b>				<b>59,421,928.00</b>

**Describe how any "Investment Mobilized" was identified**

Notes: Currency Equivalents Currency Unit = Malaysian Ringgit, MYR 1 USD = MYR4.23, rounded to the nearest thousand Source: UN Operational Rates of Exchange, Effective Date: 01 Dec 2021 During PPG phase, discussions with relevant government agencies and private sector (e.g., local public transportation fleet operators, technology solutions providers) on co-financing and co-investments have been held. A significant amount of co-financing has been mobilized during the project preparation grant phase and additional co-financing from other partners is expected to materialize during implementation, totalling 121,821,928 USD. This co-financing is the result of extensive consultations with public and private partners before and during PPG to identify needs and shared priorities where the GEF grant could have the largest impact. There is confidence that this co-financing and investment will materialize but given the large amount, the project will set a total of 59,421,928 USD as a co-financing target as a risk mitigation measure in case the larger amount is not realized due to ongoing uncertainty from the COVID-19 pandemic or other circumstances change during the course of the project. In particular, 78,000,000 USD in co-financing has been committed by the Ministry of Transport to purchase electric rail cars based on the results of a study under Output 1.1.2. It is still expected that the project will be able to deliver on all planned activities in the project document even if this full co-financing amount does not materialize. If the full amount does materialize, the project has estimated that an additional 5,724 tCO<sub>2</sub> would be directly mitigated from the investment. Government agencies The following co-financings and investments will be provided and mobilized from government agencies. MGTC, KASA and UNIDO will provide in-kind co-financing in the form of staff time, office space and other administrative costs as well as grant co-financing in support of project delivery. Ministry of Transport (MOT), Ministry of International Trade and Industry (MITI) and its agency, Malaysia Automotive Robotics and IoT Institute (MARii) will be providing substantial in-kind co-financing in term of expert's time, management and administration matters for specific project components as well as land for the purpose of technology demonstration. Iskandar Regional Development Authority (IRDA) has also expressed their commitment in this project, and will be providing in-kind co-financing in term of project management and investments in demonstration facility site and electric buses for the demonstration of Renewable Energy-based smart charging. Financial intermediaries and institutions will be engaged under Component 1 and 2 through Government Guarantee Scheme, Green Technology Financing Scheme 3.0 (GTFS 3.0). GTFS3.0 is part of the Government's

agenda to support Sustainable and Responsible Investment (SRI) as well as to drive green and sustainable standards in Malaysia. Jointly owned by Minister of Finance Incorporated and Credit Guarantee Corporation Malaysia Berhad, Danajamin Nasional Berhad as the Financial Guarantee Insurer manages this scheme that will provide guarantee coverage for any funding raised via the capital market (Sukuk/bond) or loan financing from financial institutions for any project that qualifies under the GTFS 3.0 program, amounting up to RM500 million. Private sector Based on the series of stakeholder engagements carried out during PPG phase, specific private sector companies have committed to support this project which consist of their investment in on-going or planned EV projects and are mentioned as in-kind contribution in their commitment letters. These co-financing and investments will be provided and mobilized from private sector following GEF support, as follows: Kuching-based battery-powered electric bus operator, Henz Pacific Sdn Bhd, has committed as project partner involving their plan to invest in the expansion of their fleet size. Proton Holdings and BMW Malaysia have also committed to contribute in this project through the supply of relevant parts and components of EV as well as investing in EV development specifically for EV battery ecosystem. Prasarana Malaysia Berhad will also be involved and invest in the project.

D. Trust Fund Resources Requested by Agency(ies), Country(ies), Focal Area and the Programming of Funds

Agency	Trust Fund	Country	Focal Area	Programming of Funds	Amount(\$)	Fee(\$)	Total(\$)
UNIDO	GET	Malaysia	Climate Change	CC STAR Allocation	1,776,484	168,766	1,945,250.00
Total Grant Resources(\$)					1,776,484.00	168,766.00	1,945,250.00

**E. Non Grant Instrument**

NON-GRANT INSTRUMENT at CEO Endorsement

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Includes Non grant instruments? **No**

Includes reflow to GEF? **No**

F. Project Preparation Grant (PPG)  
PPG Required **true**

PPG Amount (\$)  
50,000

PPG Agency Fee (\$)  
4,750

Agenc y	Trust Fund	Country	Focal Area	Programmin g of Funds	Amount(\$)	Fee(\$)	Total(\$)
UNIDO	GET	Malaysia	Climat e Change	CC STAR Allocation	50,000	4,750	<b>54,750.00</b>
Total Project Costs(\$)					<b>50,000.00</b>	<b>4,750.00</b>	<b>54,750.00</b>

## Core Indicators

### Indicator 6 Greenhouse Gas Emissions Mitigated

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO <sub>2</sub> e (direct)	346307	10332478	0	0
Expected metric tons of CO <sub>2</sub> e (indirect)	1731537	19650532	0	0

### Indicator 6.1 Carbon Sequestered or Emissions Avoided in the AFOLU (Agriculture, Forestry and Other Land Use) sector

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO <sub>2</sub> e (direct)				
Expected metric tons of CO <sub>2</sub> e (indirect)				
Anticipated start year of accounting				
Duration of accounting				

### Indicator 6.2 Emissions Avoided Outside AFOLU (Agriculture, Forestry and Other Land Use) Sector

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO <sub>2</sub> e (direct)	346,307	10,332,478		
Expected metric tons of CO <sub>2</sub> e (indirect)	1,731,537	19,650,532		
Anticipated start year of accounting	2022	2022		
Duration of accounting	10	10		

### Indicator 6.3 Energy Saved (Use this sub-indicator in addition to the sub-indicator 6.2 if applicable)

Total Target Benefit	Energy (MJ) (At PIF)	Energy (MJ) (At CEO Endorsement)	Energy (MJ) (Achieved at MTR)	Energy (MJ) (Achieved at TE)
Target Energy Saved (MJ)		394,576,965,717		

### Indicator 6.4 Increase in Installed Renewable Energy Capacity per Technology (Use this sub-indicator in addition to the sub-indicator 6.2 if applicable)

Technology	Capacity (MW) (Expected at PIF)	Capacity (MW) (Expected at CEO Endorsement)	Capacity (MW) (Achieved at MTR)	Capacity (MW) (Achieved at TE)
Solar Photovoltaic	4.10	4.10		
<b>select</b>				

**Indicator 11 Number of direct beneficiaries disaggregated by gender as co-benefit of GEF investment**

	Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)
<b>Female</b>	5,000	5,000		
<b>Male</b>	5,000	5,000		
<b>Total</b>	10000	10000	0	0

Provide additional explanation on targets, other methodologies used, and other focal area specifics (i.e., Aichi targets in BD) including justification where core indicator targets are not provided

The project will generate multiple global environmental benefits, building on a series of baseline initiatives currently being undertaken. The GHG emission reduction is calculated using a top-down model developed by UNEP for the Global E-Mobility programme using the GHG calculation tool - Electric Mobility Calculator developed by United Nations Environment Programme for national assessment of energy use, emissions and costs of light duty vehicles, two wheelers and buses until the year 2050. This approach differs from the bottom-up methodology that was applied during the PIF stage. The top-down methodology has been adopted in support of greater consistency across GEF electric mobility projects. For emission reduction estimation: ? Direct emission reduction is calculated using technical lifetime of vehicles (5 to 10 years, depending on vehicle/equipment type) ? Secondary direct and indirect emission reductions are calculated for the project implementation time (5 years) and additional 10 years accounted for the investment lifetime of vehicles/equipment after project implementation. Secondary direct and indirect GHG emission reductions are calculated using 40% causality factor. These emission reductions are a result of a wider changes in the country reflecting projects policy work and stakeholder engagement which are reflected in increased number of electric vehicles in the country. In line with GEF guidance "Calculating Greenhouse Gas Benefits of Global Environment Facility Transportation Projects", a standard project influence period for GEF effects has been assumed to be 10 years. This means that a typical project will exert some influence on local market development for about 10 years. Thus, investments that happen within 10 years after the project?that were not projected in the baseline? can be counted toward indirect impacts.

The GHG reductions of each subsequent investment are summed over their respective lifetimes for a cumulative measurement. The project will contribute to the mitigation of greenhouse gases in the Malaysia transport sector with an estimated reduction of 10,332,478 tonnes of CO<sub>2</sub>eq direct (120,002 tCO<sub>2</sub>eq direct and 10,206,752 tCO<sub>2</sub>eq direct secondary reductions), 19,650,532 tCO<sub>2</sub>eq indirect and cost per direct tonne reduction of approximately 5.82 USD. These estimations are based on the increased use of e-vehicles and project transport infrastructure interventions (charging stations supported by PV). The project estimates that the equivalent of 125 conventional vehicles is kept off the road and replaced with 125 electric substitutes (2 EV segments), all supported by PV generated power. If full co-financing is realized in investment for electric train cars, an additional 100 vehicles are estimated to be removed for an additional direct emission reduction of 5,724 tCO<sub>2</sub>e (this amount has not been included in calculation for Table E) The calculation is based on the comparison of 'e-mobility scenario' with 'BAU' using the input data on vehicle stock and share of vehicle types (gasoline, diesel, electric), well-to-tank grid emissions, GDP, population and expected annual growth of the country's economy. Please refer to GHG Emissions Mitigation Annex and the Global Environmental Benefit section of this document for more details. Under Component 2, an estimated of at least 6 capacity of PV is anticipated to be installed, depending on the implementation of the associate pilot projects and the energy saved is evaluated through the same methodology as for the GHG emissions. The increased use of low-carbon transportation and infrastructure will directly serve approximately 10,000 persons during the project, of which 50% are assumed to be women.

## **Part II. Project Justification**

### **1a. Project Description**

#### **Acronyms:**

12 MP	12 <sup>th</sup> Malaysia Plan
BRT	Bus Rapid Transit
EC	Energy Commission
EE	Energy Efficiency
EPU	Economy Planning Unit
EV	Electric Vehicle
EVIC	Electric Vehicle Interoperability Centre
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GTCCC	Green Technology and Climate Change Council
GTFS	Green Technology Financing Scheme
GTMP	National Green Technology Master Plan
KTMB	Keretapi Tanah Melayu Berhad
KASA	Ministry of Environment and Water (English for Kementerian Alam Sekitar dan Air)
KM	Knowledge Management
KPKT	Ministry of Housing and Local Government (English for Kementerian Perumahan dan Kerajaan Tempatan)
LCMB	Low Carbon Mobility Blueprint
MGTC	Malaysian Green Technology and Climate Change Corporation
MITI	Ministry of International Trade and Industry
MOSTI	Ministry of Science, Technology and Innovation
MRT	Mass Rapid Transit

NAP	National Automotive Policy
NTP	National Transport Policy
PMU	Project Management Unit
SEDA	Sustainable Energy Department Authority
TNB	Tenaga Nasional Berhad
UNIDO	United Nations Industrial Development Organisation
USD	US Dollars

#### DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN WITH THE ORIGINAL PIF

The objective of the Accelerating the Adoption and Scale-up of Climate-smart Transport in Malaysia (AASCT) project remains the same with the original approved PIF. The project's objective is to enhance the ecosystem in Malaysia for accelerated adoption of EV including promoting sustainable use of batteries and support the implementation of national policy that promotes the reduction of GHG emissions in transportation. The general framework of the project also remains the same and structured into three main components: (i) Strengthening the national policy and institutional frameworks into implementation of up-scaling low carbon transport programme; (ii) Investment and commercialisation of sustainable transport technologies; (iii) Capacity building and scale-up; and (iv) Monitoring and Evaluation. These are three crucial components that will drive the project towards achieving its objective.

Continuing the momentum of successes from the previous GEF-funded projects for low carbon mobility in Malaysia, this project will bring about strategic outcomes for Malaysia's EV ecosystem especially in supporting the implementation of recently adopted Low Carbon Mobility Blueprint 2021-2030 (LCMB), one of the key deliverables of GEF5- Energy Efficient Low-Carbon Transport in Malaysia (EELCT) implemented in 2016-2020. This project will also be part of an upcoming roadmap for LCMB's Focus Area B, EV Roadmap 2021-2030 (EVR). EVR aspires for Malaysia to become a prominent global value chain player and preferred technology partner for EV and EV to be mainstreamed for socio-economic benefits towards achieving low carbon mobility agenda. In parallel, this project would also directly support the National Electric Bus Roadmap for National Transport Policy 2019-2030 to drive the decarbonising of public transportation in Malaysia through the adoption of electric buses.

The project's emphasis on inclusivity, consultative and participatory approach during the PPG phase stakeholder consultation has resulted in 3 confirmed demonstration projects in distributed localities across Malaysia at (i) Cyberjaya at 26km south of downtown Kuala Lumpur in central of Peninsular Malaysia, (ii) Iskandar Malaysia, Johor bordering with Singapore at the southern of Peninsular Malaysia and (iii) Kuching, in East Malaysia. Each demonstration projects with its own unique setting and supporting ecosystem would provide rich learning experiences and high potential for wide replication across other cities nationwide in the future.

Further to PIF approval, necessary information has been gathered from intensive and extensive consultation with various stakeholders during PPG phase. The CEO Endorsement Document has taken into consideration important aspects of GEF and UNIDO's principles and guidelines that include gender mainstreaming, Environmental and Social Management Plan (ESMP) and GEF Guidelines for Implementation of the GEF Public Involvement Policy.

Component	PIF		CEO Endorsement		Comment/Justification
	GEF Budget	Co-financing	GEF Budget	Co-financing	
Component 1: Strengthening policy	500,000	150,000	400,000	17,131,928	Budget was well scoped at PIF stage. Ministry of Transport has indicated investment in 6 electric trains to be made following study under Output 1.1.2 and co-financing amount could be higher yet.
Component 2: Investment	900,000	14,130,000	1,000,000	36,794,000	Additional co-financing was secured based on investment from public and private sector.
Component 3: Capacity Building and Scale-up	135,000	150,000	No change	No change	Budget and co-financing were well scoped at PIF stage
Component 4 Monitoring and Evaluation	79,865	100,000	No change	No change	Budget and co-financing were well scoped at PIF stage
Project management	161,498	1,670,000	No change	5,246,000	Co-financing for management increased in line with envisaged workload

Table 1: Changes to the project Budget Allocation

**a) the global environmental and/or adaptation problems, root causes and barriers that need to be addressed (systems description);**

*Climate change, global drivers of GHG emissions in the transportation sector, and global electric mobility*

Human influence has changed and warmed the climate at a rate that is unprecedented in at least the last 2,000 years and observed warming is driven by GHG emissions from human activities, according to the 2021 Intergovernmental Panel on Climate Change (IPCC) report. Today human activities in the transport sector are responsible for nearly one-quarter of global energy-related direct CO<sub>2</sub> emissions and is a significant contributor to air pollution. Oil has been the predominant energy source in the transport sector, providing 92% of final energy over the past decade. Increased demand for transport for people and goods and dependence on internal combustion engines (ICE) vehicles that run on oil products have called for more oil use and led to increased carbon dioxide (CO<sub>2</sub>) emissions.

Global and local objectives and commitments to improve climate and air quality underscore that the transport sector has a critical role to play and drive rapid change. Over the last decade momentum has accelerated to deploy a range of powertrains and alternative fuels. The 2010s were ground breaking for the introduction of electric vehicles which have several benefits, including zero tailpipe emissions, better efficiency than internal combustion engine (ICE) vehicles and large potential for GHG emissions reduction when coupled with a low-carbon electricity generation

sector. Provided the electricity used by an electric vehicle (EV) comes from renewable energy, electric mobility can be seen as a climate smart solution to decarbonizing the transport sector.

To date, countries have announced 100% zero-emission vehicle targets or the phase-out of internal combustion engine vehicles through 2050, or allowing new sales to be electric cars, in support of decarbonizing transportation sectors, meeting climate targets, promoting cleaner air as well as economic development. Environmental and sustainability objectives are major drivers behind countries' policy support in the development and deployment of electric powertrains for transport. Drivers for the uptake in the adoption of electric mobility also include reductions in battery prices, evolution in battery technologies, and developments in charging methods.

Although electric vehicles increase electricity demand, they reduce oil demand and greenhouse gas emissions. In 2019, there were about 7.2 million electric cars on the world's roads, and these electric vehicles in operation globally avoided the consumption of almost 0.6 million barrels of oil products per day. In 2019, the electricity generation to supply the global electric vehicle fleet emitted 51 Mt CO<sub>2</sub>-eq, about half the amount that would have been emitted from an equivalent fleet of internal combustion engine vehicles, corresponding to 53 Mt CO<sub>2</sub>-eq of avoided emissions. GHG emissions savings from EVs are achieved thanks to the fact that the high energy efficiency of the electric powertrain combined with the current global carbon intensity of electricity systems emit less than ICEs in most countries.

Under the International Energy Agency (IEA)'s Sustainable Development Scenario which incorporates rapid grid decarbonization and the targets of the EV30@30 Campaign to collectively reach a 30% market share for electric vehicles in all modes except two-wheelers by 2030, the global electric vehicle stock (excluding two/three-wheelers) grows by 36% annually, reaching 245 million vehicles in 2030 – more than 30 times above today's level. In this scenario, the global electricity demand from EVs (including two/three-wheelers) increases nearly eleven-fold relative to 2019, to almost 1,000 TWh in 2030, but the global EV fleet displaces 210 Mtoe (4.2 million barrels a day) of gasoline and diesel in 2030, leading to 440 Mt CO<sub>2</sub>-eq of avoided GHG emissions in 2030.

The IEA's recent Net Zero by 2050 Roadmap provides a cost-effective and economically productive pathway to reach this formidable and critical goal of net zero emissions by 2050, setting out more than 400 milestones for what needs to be done, and when, to decarbonise the global economy in just three decades. Among these milestones include the massive deployment of electric vehicles. Staying on the path to net-zero emissions requires the massive deployment of all available clean energy technologies such as renewables, electric vehicles and energy efficient building retrofits between now and 2030. Net zero means huge declines in the use of coal, oil and gas and that by 2045, new energy technologies will be widespread. This requires steps such as halting sales of new internal combustion engine passenger cars by 2035 and ensuring that the vast majority of cars on the roads will be running on electricity or fuel cells by then.

To be a zero-carbon car from a life cycle perspective, a car will also need to be manufactured with zero material carbon emissions. The World Economic Forum's recent report on Materials Roadmap for the Zero-Carbon Car states that the system-wide change is needed to also create

circularity in the automotive sector. The report shows that a large proportion of automotive material carbon emissions could be abated by 2030 at no net-cost increase using technologies and practices that could be implemented today.

Despite the current growth in EV production and adoption, significant economic, regulatory and technical barriers exist to their mass adoption:

Economic barriers:

- ? EVs generally have higher price tags than conventional ICE vehicles.
- ? EVs face high costs of acquisition with fleet operators facing high capital costs to replace ICE vehicles with EVs (although EVs have very low operating costs)

Regulatory barriers:

- ? The characterization of EV charging as the sale of electricity or as a service.
- ? Tariff issues on charging stations and the cost-prohibitive prices on electricity.

Technical barriers:

- ? Charger standards and protocols not being standardized in countries resulting in lack of interoperability.
- ? Grid stability related issues due to normal EV charging behavior place extra load on the grid during peak hours.
- ? Battery performance issues with respect to safety at high temperatures and the life cycle of the battery.

Information barriers:

- ? General awareness among policy makers, the private sector and the public about EVs, their performance, as well as incentives and regulations in place for their use
- ? Range anxiety due to EVs having limited range compared to ICE cars based on the size of the battery.

### *Climate Change and Drivers of GHG Emissions in Malaysia*

Malaysia is a party to the United Nations Framework Convention on Climate Change (UNFCCC). Consonant to the Convention, Malaysia ratified the Kyoto Protocol in 2002 and the Paris Agreement in 2016. Under the Paris Agreement, Malaysia had communicated its updated Nationally Determined Contributions (NDC) to reduce its economy-wide carbon intensity (against GDP) of 45% in 2030 compared to 2005 level. The 45% of carbon intensity reduction target is unconditional and is an increase of 10% from the earlier submission. In addition, Malaysia's NDC covers 7 GHG instead of 3 GHG previously.

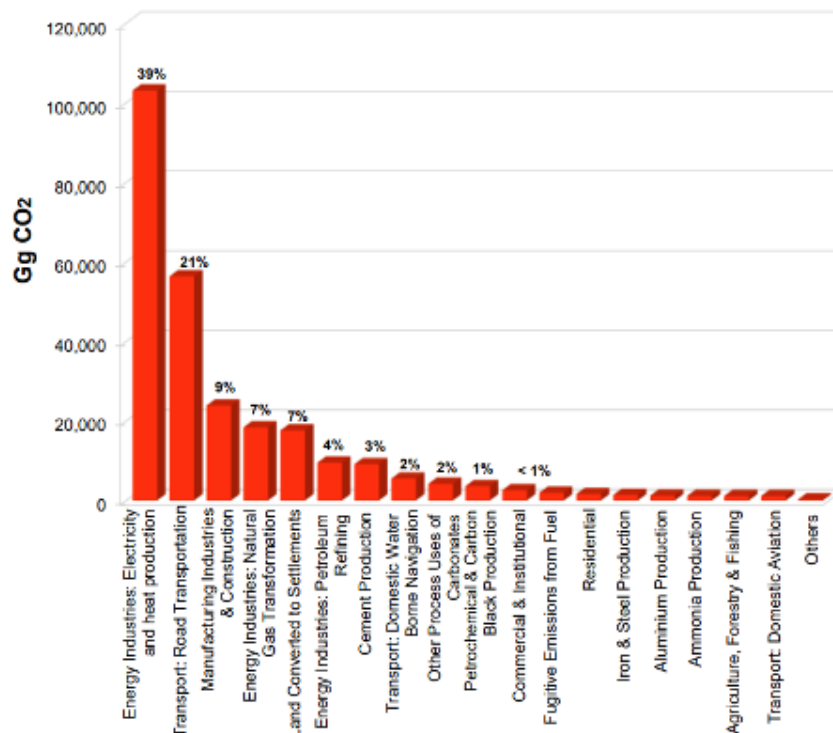


Figure 1: Major sources of carbon dioxide in 2016

Source: Malaysia's Third Biennial Update Report submitted to the United Nations Framework (2020)

In 2017, Malaysia's Final Energy Consumption (FEC) stood at 62,848 ktoe (kilotonnes of oil equivalent), which is 9.8% higher than the previous year. The transportation sector is the second fastest growing sector overall, its total FEC is 23,522 ktoe or 37 percent of the country's total. Based on the National GHG Inventory done for UNFCCC, as a whole, the road transportation sector has consistently remained the second largest GHG emitting sector in the country accounting for 21% of the country's total GHG emissions in 2016 (see Figure 1). In 2016, out of the total carbon emissions from the land transport sector, 71% originated from cars and 9% from motorcycles. (GTMP, 2017). Malaysia's transport infrastructure has continued to develop over the years with a 3.5x increase in road network from 1995 to 2016 (NTP, 2018). In order to meet its targets and move towards a low-carbon future, Malaysia will need to address emissions from transport through a mix of urban planning, increased adoption of sustainable energy and technological development of low-carbon modes of transport. Although challenges from COVID-19 pandemic to Malaysia is constraining the implementation of planned climate change actions as many resources are being diverted for urgent needs to overcome the disease, Malaysia remains committed to fulfill NCD in accordance to Malaysia's commitments under the UNFCCC and Paris Agreement.

#### ***Malaysia's transportation sector and barriers that need to be addressed***

The population in Malaysia is reaching 32.7 million in 2021 and is estimated to grow up to 41.5 million by 2040. With 8 million household and more than 76% population living in urban area, there are 31.2 million units of vehicles and the Average Annual Kilometre Travelled (AAKT) per person is 21,184 km. This demographic trend as well as impacts from other development drivers pose a challenge for policymakers to strategies on ensuring transportation is accessible, affordable,

safe and sustainable. As the governance of land transport systems in Malaysia is distributed across many government agencies and state authorities, another challenge is in ensuring holistic integration, implementation and monitoring of policies and plans for sustainable transportation goals such as energy usage and efficiency.

Vehicle Category	Number of Registered Vehicle
Car	13,618,028
Motorcycle	13,607,369
Taxi	112,224
Hire & Drive Car	79,370
Bus	69,675
Goods Vehicle	1,308,269
Others	950,252
Total	29,745,187

Table 2: Number of accumulated registered vehicles by vehicle category and its corresponding volume share in 2018

Source: Road Transport Department (RTD)

The number of registered vehicles is increasing by approximately 6% per annum from 20.2 million in 2010 to nearly 30 million in 2018. The ratio of vehicles to the population (0.9 in 2018) was one of the highest in the region. Increasing level of motorisation are largely due to the growing population with increasing purchasing power for vehicle ownership, inadequate first- and last-mile connectivity, urban sprawl and relatively affordable price of gasoline. This also causes the shift from private to public transport, primarily rail-based transport and transit-oriented development in the urban setting a challenge.

On the other hand, uncompetitive transport and logistics industry are also identified as major issues for transportation sector. There are more than 1.3 million registered goods or freight vehicle in Malaysia, with 26% accounts for 4000-6000cc and 24% are those above 6000cc. Vast majority, 76% of these vehicles run on diesel while 57.1% is certified as 'green diesel' and the rest have diesel engines without such certification. The trend in recent years showed annual increase of around 30,000 new registration and although at present this segment represents only 4.44% of total vehicle population in the land transport sector, its GHG emissions amount to 22.7% of total GHG emissions. This corresponds to current situation in Malaysia whereby 98% cargo freight is transported by road and only 2% by rail. Rail freight uses about 15% as much energy as heavy duty trucks per tonne-km. Therefore, rail freight has more energy efficiency and lesser carbon emission compared to road freight on a per tonne-km travel basis. However, barriers remain for the shift of freight from road to rail due to disadvantages of current railway option such as service inefficiency, lack of door-to-door services, higher cost and sometimes unreliable. In addition, majority of buses run on subsidised diesel. The cost of diesel buses is much lower although it is known to produce high emission and harmful gases. Therefore, traffic congestion, air pollution and GHG emissions from land transportation remains a major challenge for Malaysia.

#### ***Gaps and barriers to adoption and production of EVs in Malaysia:***

Availability, affordability and awareness on EV and readiness of EV infrastructure

Although electric vehicles are on the market in Malaysia, they presently make less than 1% of annual sales. Significant barriers remain to their large-scale adoption, many of which align with trends globally. Malaysian consumers have few options in terms of EV models to choose from and face higher upfront purchasing costs compared with the cost of comparative vehicles (ICE) with internal combustion engines. The benefits of electric vehicles, such as lower maintenance and service costs, are also not well understood by consumers. Additionally, while Malaysia has seen recent growth in its charging infrastructure, consumer concerns around the range of battery electric vehicles (BEVs) persist. The relatively affordable price of gasoline in Malaysia for ICE vehicles also provides less economic incentive for consumers to shift to EVs.

The adoption of electric vehicles will also require further alignment within the Malaysian automotive industry as a whole. The current scheme for internal combustion engines remains relatively favorable, meaning assistance to the local EV industry alone will not be enough to support mass adoption of electric mobility. The challenge will have to be addressed systematically in order to create the competitive edge of the EV industry.

Malaysian consumers have few options in terms of EV models to choose from and face higher upfront purchasing costs compared with the cost of comparative vehicles (ICE) with internal combustion engines. The relatively affordable price of gasoline in Malaysia for ICE vehicles also provides less economic incentive for consumers to shift to EVs. Illustratively, in January 2021, the price of petrol and diesel in Malaysia is approximately 1.84 and 2.08 Malaysian Ringgit (0.45 USD and 0.51 USD) respectively. There is presently no electricity tariff for transport and most of the public stations installed do not require payment for charging but require an annual membership card. However, even with a relatively affordable membership fee (or in some cases no fee), the price of gas remains relatively affordable in comparison. Offering public charging of EVs for free has also been identified to be likely unsustainable in the long-term as there is no cost-recovery in place for the stations, especially if electric mobility and charging infrastructure expands in the country. Between 2015 and 2020, public charging stations have grown in that same period from no stations installed to 524 being installed presently. Renewable energy represents approximately 3.5% of Malaysia's electricity mix with the remainder primarily coming from natural gas and coal, meaning charging infrastructure is supported by fossil fuel sources of energy.

In order to meet its targets and move towards a low-carbon future, Malaysia will need to address emissions from the transportation sector through a mix of urban planning, increased adoption of renewable energy supporting charging infrastructure and technological development of low-carbon modes of transport. While there have been some encouraging signs of growth in electric mobility and charging infrastructure, barriers remain to meeting the large-scale adoption required to contribute to decarbonisation of the country's transportation sector as well as ensure that the safe reuse and disposal of EV batteries is accounted for as the EV sector grows. Many of these barriers mirror those found globally including consumer and fleet operators having concerns about the upfront cost of vehicles, range anxiety and lack of understanding on the concept of total cost of ownership. Although there have been encouraging steps towards the promotion of electric mobility there remain gaps in policy, regulation and technical challenges to the scale-up of EVs, specifically with respect to ensuring charging infrastructure is supported by sustainable energy, enabling the electrification of public transport and freight, the sustainable use of batteries and supporting a national ecosystem for EV manufacturing and value chain development. These key barriers are expanded on below:

#### Barrier 1: Gaps in policy and regulations for smart charging and sustainable battery use

There are presently no policies or regulations in place to support uptake of smart charging especially with respect to bi-directional charging. There is the perspective among stakeholders that EV growth would be problematic for the load demand. Policy makers and regulators lack information, references and tools to inform how growth in electric mobility could support grid management and there is a disconnect between the development of charging infrastructure and the adoption of renewable energy. To ensure charging infrastructure growth does not place drastic burden on national and local grids, as well as to create co-benefits in the form of increased grid flexibility and penetration of renewables, guidelines and standards are required to support implementation of smart charging. Likewise, there is presently no policy, regulations and framework for managing any projected growth in EV battery disposal. Planning is also necessary for developing an ecosystem that supports reuse recycling and safe disposal.

#### Barrier 2: Electric mobility for public transport and freight has not been integrated into existing transport policy and planning

National policies and plans for public transport and freight presently do not include consideration for the adoption of electric mobility. There is a lack of knowledge and data on how different electric mobility solutions could be applied as well as how to approach integrating electric into existing plans. There is also lack of knowledge and capacity for monitoring GHGs from the transport sector at the local level creating challenges for establishing baselines, tracking progress and articulating potential benefits of electrifying transport and incentivizing further action. The benefits of electric fleets, such as lower maintenance and service costs, are also not well understood.

#### Barrier 3: Localization of EV manufacturing and value chains within Malaysian automotive industry is low

The adoption of electric vehicles will require further alignment within the Malaysian automotive industry as a whole. The current scheme for internal combustion engines remains relatively favorable, meaning assistance to the local EV industry alone will not be enough to support mass adoption of electric mobility. Local contractors that install charging infrastructure are reliant on international manufacturers and suppliers which has impacted the reliability, serviceability and deployment of charging infrastructure locally. The challenge will have to be addressed systematically in order to create the competitive edge of the EV industry including developing local value chains, addressing gaps in expertise and reviewing incentives that favour ICE vehicles. An example of this is Malaysia's current taxes and duties (import tax, excise duty, sales tax and road tax), that are competitively based on engine CC, which pose challenges to making EVs competitive. The EV import duty privilege presently sits at 10% in comparison to 75% to 105% import duty privileges for ICE vehicles. Support is also necessary for developing an ecosystem for entrepreneurship for electric mobility along the value chain. Lack of consistent standards for batteries also creates a barrier to the adoption of battery swapping modalities that could support upfront reductions in EV costs.

Barrier 4: Lack of demonstrations for different EV business models, use of smart charging and battery repurposing and recycling

As indicated above, public charging of EVs for free has also been identified to be likely unsustainable in the long-term as there is no cost-recovery in place for the stations, especially if electric mobility and charging infrastructure expands in the country. Additionally, smart and bidirectional charging has not been demonstrated, causing challenges for understanding how to localize the technology as well as practical implication it might have for the grid, public and private fleet adoption as well as consumer behaviour. There is a need for developing business models and demonstrating smart charging infrastructure for all types of vehicles (passenger, commercial and public transport) to ensure the system is financially viable as well as ensures any growth does not put strain during peaks on the grid, while supporting the penetration of renewable energy. Small-scale and controlled demonstrations are necessary to increase knowledge and understanding among stakeholders on how the technology could be applied. Alternative business models and technological solutions for vehicles that reduce the upfront costs have also not been trailed, such as battery leasing and swapping for electric vehicles. EV battery reuse and recycling also requires assistance in the form of technology transfer and localization.

Barrier 5: Lack of knowledge, capacity and awareness on electric mobility and sustainable battery use

This barrier has been expressed across the previous four barriers as it is cross-cutting. There remains a need for communicating the benefits of electric mobility among policy makers, especially at the local level, as well as among fleet managers. The concept of total cost of ownership (TCO) and EVs relative low maintenance and fuel costs are also not salient in the minds of fleet managers. Capacity is also required to support development of Malaysia electric mobility value chain. This includes the sustainable use of batteries and approaches to their reuse and recycling.

#### **b) the baseline scenario and any associated baseline projects,**

The gaps and barriers identified above highlight the additional actions necessary for Malaysia to accelerate its adoption of electric mobility nationally in addition to existing actions already being taken. This section will now provide an overview of Malaysia's existing policy, initiatives, and state of progress while the alternative scenario will outline how this project will address the aforementioned gaps and barriers.

#### **Baseline scenario at national level**

##### **Macro and Sectoral Policy Framework**

**Malaysia's Shared Prosperity Vision 2030** is Malaysia's commitment to be a nation with sustainable growth with a fair distribution of growth across income groups, ethnicities, regions and supply chains. Key Economic Growth Activities include logistic, transportation and sustainable mobility. This vision provides an overarching decade-long framework for two Malaysia's development plans which are 12<sup>th</sup> Malaysia Plan 2021-2025 and 13<sup>th</sup> Malaysia Plan 2026-2030.

The present development plan, **12th Malaysia Plan 2021-2025**, is the final part of Malaysia's 6-step strategy approach under the National Economic Recovery Strategy (Resolve, Resilience, Restart, Recovery, Revitalize, & Reform) to ensure that Malaysia has a strong footing in not only addressing socioeconomic issues and challenges during the COVID-19 pandemic but also in achieving sustainable long-term economic growth. Chapter 8 on Advancing Green Growth for Sustainability and Resilience set out strategies for Enhancing Green Mobility including encouraging private sector to invest in advancing next generation vehicles, technologies and supporting infrastructure, such as energy-efficient, hydrogen-powered and electric vehicles, and their charging stations. Chapter 12 outlined strategies on Enhancing Efficiency of Transport and Logistics Infrastructure with the aim to further enhance the efficiency of transport and logistics services by prioritizing efforts to provide an integrated, affordable, reliable and seamless transport system.

In Malaysia, **National Physical Plan (NPP)** sets the framework for overall spatial development and urban planning, to be interpreted into strategies and planning actions at national, state and local levels especially the local government authorities. NPP 4 2021-2025 emphasizes national security planning, digital infrastructure enhancement, smart development, carbon-neutral nation, national food security assurance and inclusive and livable community development.

The **National Land Public Transport Master Plan (NLPTMP)** has the potential to improve the Quality of Life and Environmental Sustainability focuses on urban rail (i.e., MRT, LRT and Monorail), bus and other supporting infrastructure (i.e., Bus Rapid Transit, Park n Ride bays, etc.). The Logistic and Trade Facilitation Master Plan has action item on Creating Regional Footprint (2020 and beyond) with the objective of developing and promoting logistics service providers who can compete globally, taking advantage of the AEC and liberalisation of the logistics industry. Its action item includes provide green initiative support via acceleration of Green Logistic Industry.

**Malaysian Intelligent Transport System (ITS) Blueprint 2019-2023** by the Ministry of Works Malaysia was introduced for data sharing between agencies in Malaysia and big data analytics, allowing for information and communication technologies to be applied in the road transport sector, traffic management, mobility management and interfaces with other modes of transport action. The blueprint also developed a pathway to set up roadside communication infrastructure for NxGV such as EVs and autonomous vehicles.

The **National Solid Waste Management Policy 2016** under the purview of Ministry of Housing and Local was introduced for the management of solid waste, including Reduce, Reuse and Recycle (3R) implementation plan and in the context of EV, EV battery reuse and recycle. Relevant regulation relating to this would be Malaysia's Act 127 Environment Quality Act 1974 ? Environment Quality (Scheduled Wastes) Regulation 2005 that regulates the storage, disposal, treatment, recovery of material from waste including waste of batteries containing cadmium and nickel, or mercury or lithium. This would also relate to the Malaysian Standard, MS 2697:2018 Motor Vehicle Aftermarket Repair-4R (repair, reuse, recycle and remanufacture) and MS 2696: 2018, Motor Vehicle Aftermarket 2S (service and spare parts).

**National Green Technology Master Plan (GTMP) 2017-2030** was introduced as a national strategic plan and implementation framework to catalyse green growth towards sustainable development and position Malaysia as a Green Technology hub by 2030.

**Low Carbon Cities Framework (LCCF)** has also been formulated in 2011 to provide framework and tool for further implementation of the whole spectrum of strategic and policy development on sustainability within the

Malaysian context; with specific focus on tracking carbon emissions at city levels. LCCF addresses carbon emissions in four (4) areas: Urban Environment, Urban Infrastructure, Urban Transportation, and Buildings. Local authorities have adopted LCCF to achieve their green agenda, for instance, Petaling Jaya City Council that provided an incentive in terms of an assessment tax rebate scheme for installing public or home charger or possession of HEVs/EVs by property/homeowners.

At state level, many state governments and local government authorities have embarked on efforts towards sustainability for their overall planning (please refer to elaboration of these efforts under the description on the demonstration sites). A number of municipalities and other sub-national public entities are moving forward to support sustainable transport initiatives including encouraging modal switching, including some supported by various municipalities are planning / implementing projects to encourage modal-switching, in part with the cooperation of the UNIDO/GEF project Sustainable-City Development in Malaysia (GEF ID #9147) and the UNDP/GEF project Green Technology Application for the Development of Low Carbon Cities (GTALCC) (GEF ID #5329).

Malaysia's Third National Communication and Second Biennial Update Report submitted to the UNFCCC

reported that increase availability of electric vehicles in the market is one of mitigation scenarios towards contributing in reduction of 12.41 Million tonnes CO<sub>2</sub>eq emissions from transport by 2030.

### **Sectoral and Specific Policy Framework for Electric Vehicle**

**National Transport Policy (NTP) 2019-2030** under the purview of the Ministry of Transport aims to develop a sustainable transport sector that accelerates economic growth towards a green transport ecosystem and provides strategic direction for a sustainable transport sector. Policy Thrust 4 on Advancing towards Green Transportation Ecosystem highlighted 5 main strategies and 35 action items, including the strategies to shift land cargo freight to rail and deploy Electric Vehicles as part of the green transport ecosystem. The policy made reference to the Low Carbon Mobility Blueprint (LCMB) 2021-2030 in rolling out the implementation plan for the policy. NTP serves as macro strategic direction for the transport sector and ensure that sectoral plans such as LCMB, Land Public Transport Master Plan, Logistics and Trade Facilitation Master Plan, Rail Industry Roadmap, Highway Development Plan and others are complementing one another.

**National Automotive Policy (NAP)** was introduced in 2006 to transform the domestic automotive industry and integrate it into the increasingly competitive regional and global industry network. NAP was reviewed in 2014 focuses on green initiatives, development of technology and human capital, market expansion, and enhancement of the automotive industry ecosystem. NAP2020 is an extension of NAP2014 with an emphasis on Next Generation Vehicle (NxGV), Mobility as a Service (MaaS), and Industrial Revolution 4.0 (IR4.0).

**Low Carbon Mobility Blueprint (LCMB) 2021-2030** was approved by the Cabinet in October 2021, assessed the best options in energy and GHG mitigation planning in the transportation sector for Malaysia with specific focus on decarbonising land transportation and driving the principles of sustainable mobility for Malaysia. LCMB are organized into four focus areas focused on addressing GHG emissions and energy reduction with each having a set of strategies. Each is outlined here to provide context to where electric mobility fits within the larger approach:

Focus Area A: GHG Emission & Energy Reduction via Vehicle Fuel Economy & Emission Improvement

- i. Encourage adoption of low emission vehicle (light duty vehicle)
- ii. Strengthen Energy Efficient Driving Program

Focus Area B: GHG Emission & Energy Reduction via Electric Vehicle Adoption

- a. Electric car adoption in strategic application
  - i. Government led by example
  - ii. EV adoption for taxi fleet
  - iii. EV incentives for the market
  - iv. Ensuring EV charging infrastructure sufficient for private EV penetration
  - v. Supporting the manufacturers of local EV cars
- b. Electric bus adoption in strategic application
  - i. Government led procurement for EV bus fleet
  - ii. Electric buses as stage buses, feeder buses, communal service by municipalities, shuttle services by company, shopping complex, hotels, etc.
  - iii. Supporting the manufacturers of local EV buses
- c. Electric motorcycle adoption in strategic application
  - i. Electric motorcycle for government enforcement fleet
  - ii. Electric motorcycle for delivery services
  - iii. Standards and regulations
  - iv. Battery swapping
  - v. Supporting local manufacturers of electric motorcycle

Focus Area C: GHG Emission & Energy Reduction via Alternative Fuel Adoption

- i. Enhance the use of biodiesel in road transport
- ii. Creating the eco-system for alternative fuel industry growth

Focus Area D: GHG Emission & Energy Reduction via Mode Shift

- i. Mode shift private transport towards public transport
- ii. Land use development promoting public transport
- iii. Improvement of traffic flow
- iv. Freight mode shift from road to rail
- v. Promote active mobility

With 4 Focus Areas and 10 Strategies developed under this Blueprint, Focus Area B is targeting GHG emission and energy reduction via electric mobility adoption in strategic applications. 3 Strategies laid out for Focus Area B which are: adopting the electric car, bus and motorcycle.

Under Focus Area D on GHG Emission & Energy Reduction via Mode Shift, Strategy 9 calls for the shift of freight mode from road to rail by expanding rail network to cater for freight transport. A detailed study will be required to explore the feasibility and propose technology options for the powertrain. The shift of freight from road to rail will result in significant energy savings and GHG reductions.

Towards implementing Focus Area B, Electric Vehicle Roadmap 2021-2030 in the pipeline of approval, aims for Malaysia to become a prominent global value chain player and preferred technology partner for EV and EV to be mainstreamed for socio-economic benefits towards achieving low carbon mobility agenda.

The LCMB outlines an enabling framework for implementation of the plan focusing on five areas:

1)

Strengthening institutional framework; 2) Facilitating conducive economic instruments; 3) Capacity, skills and knowledge development; 4) Technology nurturing and commercialization; and 5) Consumer communication, education and public awareness.

Within these areas, some key areas this project can help address have been identified. With respect to strengthening institutional framework, a need has been identified to ensure policy coherence across existing policies on transport at different levels of government, in particular with respect to ensuring alignment between national policy and spatial planning at the city and district level as it applies to mode shift and planning for electric charge infrastructure.

In relation to LCMB, this project scope is specific to advancing Focus Area 2: GHG Emission & Energy Reduction via Electric Vehicle Adoption, on the vehicle electrification for car, bus and motorcycle. GEF funding and technical assistance is necessary to enable advancement of the LCMB, specifically as it relates to the adoption of electric mobility. Three specific priority areas where GEF funding would have an immediate impact based on the need for technical assistance and their alignment with GEF-7 funding priorities for electric mobility:

- i. Advance charging technology demonstration for better grid management and environmental benefit: Malaysia needs to shift further the sustainable effort on the electricity sector. Although Malaysia has pledged to raise national renewable electricity generation to 20%, demonstrations on smart charging are necessary to support awareness on the technology and how it could support raising national ambitions moving forward.
- ii. Develop the holistic repurpose and recycling solution for the lithium-ion battery: This year, Malaysia has started the Advance Automotive Treatment Facility to help address vehicle recycling. This project would add needed support into the capacity to manage the lithium-ion battery within the licenced facilities or guidelines and competencies.
- iii. Support development of Malaysia's EV supply chain: The bus and motorcycle segment have been identified as preliminary sectors for attention under this project as there are a few e-bus and e-bikes initiatives already launched in Malaysia. A post-mortem of these precedence projects would be a starting point for further development under the project. Additionally, this project would support addressing the current gap in after-sales and maintenance of the EVs.

Towards this end, **Electric Vehicle Roadmap 2021-2030** development is currently in the pipeline to translate LCMB Focus Area 2 into specific actions and implementation timeline as well as continuing past efforts under the National Electric Mobility Blueprint 2015-2020.

In parallel, **National Electric Bus Roadmap for National Transport Policy 2019-2030** under the purview of MOT is also in the formulation process through the Project under Green Technology Application for the Development of Low Carbon Cities.

This project will complement all relevant policies and plans in Malaysia with regards to low carbon mobility and transportation sector as a whole, interfacing all components of an EV ecosystem such as the governance, capacity building, industry development and R,D&I, towards accelerating the adoption and scale-up of climate-smart transport in Malaysia.

*Current Status of Conventional Vehicles Manufacturing in Malaysia:*

### **Passenger Vehicles**

The automotive industry is one of the major industries supporting the Malaysian economy. Since the early 1980s, the Government in its vision to industrialise Malaysia has spearheaded automotive industry initiatives and local manufacturers such as Perusahaan Otomobil Nasional (Proton), Perusahaan Otomobil Kedua Sendirian Berhad (Perodua), Syarikat Motosikal dan Enjin Nasional Sdn Bhd (MODENAS) and HONDA-HICOM Automotive Manufacturers (Malaysia) Sdn Bhd were established and successfully enticed foreign automotive Original Equipment Manufacturers (OEM)s to operate in Malaysia.

Fast forward to the present day, there are 571,632 passenger and commercial vehicles produced and assembled in Malaysia in 2019. The share of ASEAN automotive stood at 13% in 2018, behind Thailand (50%) and Indonesia (31%). There are 27 vehicle manufacturers and 641 parts and components manufacturers in Malaysia for production of passenger cars, commercial vehicles, motorcycles, scooters and others. The manufacturers include Perodua, Malaysia's largest car manufacturer (plant in Rawang, Selangor), Proton (Tanjung Malim, Perak), HICOM (Pekan, Pahang), UMW Holdings (Shah Alam and Klang, Selangor), Inokom Corporation Sdn. Bhd (Kulim, Kedah), Tan Chong Motor Holdings Berhad (Serendah, Selangor) and others. Some of the key auto manufacturers such as Geely Auto Group (owners of the large national automobile company, Proton) have goals that 85% of vehicles produced in Malaysia will be EEVs by 2020. Anticipating substantial increase in vehicle production volume in the future, Proton is exploring utilization of renewable energy and to reduce maximum demand (potentially via V2G) for their production line.

The majority of passenger cars assembled in Malaysia are intended for the domestic market. Perodua and Proton dominated domestic passenger car sales at 55% in 2018, while mid-range brands Honda, Toyota, Nissan, Mazda and Kia account for 37% and premium brands BMW and Mercedes 5% of total market share.

Manufacturer	Domestic Passenger Car Sales	Market Share (%)
Perodua	227,243.00	43%
Honda	102,282.00	19%
Proton	64,744.00	12%

Toyota	43,446.00	8%
Nissan	21,956.00	4%
Mazda	15,765.00	3%
Mercedes	13,118.00	2%
BMW	12,008.00	2%
Volkswagen	7,001.00	1%
Kia	5,658.00	1%
Others	19,981.00	4%
Total	533,202.00	-

Table 3: Domestic Passenger Car Sales by Manufacturer in 2018

Source: Malaysian Automotive Association (MAA)

Since 2009, various tax incentives were introduced to promote the adoption of hybrid and electric vehicles. Tax exemptions on import and excise duties of these vehicles up until December 2013 has resulted in a total of 90.65 Gg CO<sub>2</sub> eq emissions avoidance in 2016. Toyota Prius, Honda Civic Hybrid and Honda Insight were among EV passenger cars with high sales growth.

Honda Jazz Hybrid Complete Knock-Down (CKD) was the first hybrid to be assembled in Malaysia and today, there are several CKD assembly lines for passenger cars hybrid PHEV in Malaysia for original equipment manufacturers such as Nissan, Honda and Mercedes.

With regards to BEV, Nissan Leaf EV pilot program was launched in 2012 and loaned out to individuals for tests. In the following year, Mitsubishi i-MiEV was launched for commercial sale as the first BEV to be sold in Malaysia. In 2016, Malaysia introduced duty-exempt import for Tesla Model S cars with Approved Permit (AP) as part of its effort to promote EV and reduce carbon emissions in the country. The AP system is an import and export license awarded by the Ministry of International Trade and Industry (MITI). Following this, a leasing scheme was introduced through MGTC for 2016 Tesla Model S 70 and P90D, the only EV model during the period that met the parameters of the programme in term of sufficient operating range and type of passenger car. The programme allowed policy makers such as government-linked companies (GLC) for use as official cars and persons of influence to experience EV technology. The outcome of the programme is evident with many EV reviews led to the awareness of EVs not only amongst policy makers and the government, but the public in general.

These efforts have helped spur the EV ecosystem in Malaysia. The market share of EV cars grew from 0.01% in 2015 to 0.71% in 2020 and the number of public chargers has increased from 38 to over 500.

The following table summarizes the current status of EV in Malaysia and the targets set for 2030:

Vehicle Category	Number of Registered EV / EV Charging as of 2021	LCMB Targets by 2030
Electric Passenger Car	30,414 (PHEV: 30,024, BEV: 390)	15% Total Industry Volume (TIV) by 2030 Government Fleet: 10% (2022) 50% (2025) 100% (2030)

Electric Motorcycle	2,071	8% TIV by 2027 15% of TIV 2030
Electric Bus	35	2,500 by 2025 10,000 by 2030
Public Charger	510	7,700 by 2025 (7,000 Alternating Current (AC) & 700 Direct Current (DC))

Table 4: Current number of Registered EV/EV Charging and 2030 Targets

Source: Department (RTD) (2021), KASA (2021)

### EV-related Incentives

Investment Tax Allowance (ITA) introduced by Malaysian Investment Development Authority (MIDA) provided income tax exemption or equivalent of ITA for a period of 5 or 10 years to companies planning to undertake activities such as assembly of Energy-Efficient Vehicles (EEV); manufacture of critical components/systems for EEV or Non-Energy-Efficient Vehicles such as transmission, engines, airbag and components, handling and control mechanism and brake mechanism, and manufacture of components for Hybrid and EVs such as electric motors, electric batteries and batteries management systems.

In October 2021, EV-related incentives were announced with effective date 1 January 2022, on top of existing Green Income Tax Exemption (GITE) to catalyse demand, support the development of EV ecosystem and drive Malaysia's EV sector ahead. The incentives are for EVs for passenger car (including SUV and MPV), commercial vehicles and motorcycles.

No	EV-related Incentives
1.	Full exemption* from import and excise duties as well as sales tax for EVs ? 100% duty exemption for CBU electric cars up to 31 December 2023 ? 100% duty exemption for CKD electric cars up to 31st December 2025
2.	Road tax exemption of up to 100%
3.	Individual income tax relief of up to RM2,500 for the cost of purchasing and installing, renting or taking up hire purchase facilities as well as subscription payments of EV charging facilities

4.	<p>Green Technology Tax Incentive</p> <p>Green Income Tax Exemption of 70% on statutory income for qualifying EV-related Green Services green services where the period of incentive is for 3 years starting from assessment year of the first invoice related to green technology services issued</p> <table border="1"> <tr> <th>Category</th><th>Scope</th></tr> <tr> <td>Green Investment Tax Allowance (GITA) Assets</td><td>Applicable for companies that acquire qualifying green technology assets and listed under the MyHIJAU** Directory Qualifying Assets: EV (electric motorcycle/scooter, bus, MPV/truck) and EV Infrastructure (charging equipment/system)</td></tr> <tr> <td>Green Investment Tax Allowance (GITA) Projects</td><td>Applicable for companies that undertake qualifying green technology projects for business or own consumption</td></tr> <tr> <td>Green Income Tax Exemption (GITE) Services</td><td>Applicable for qualifying green technology service provider companies that are listed under the MyHIJAU Directory Qualifying Services: EV services related to installation, maintenance and repair of EV charging equipment, infrastructure and EV charging station, services related to operation of the EV charging station and services related to maintenance, repair and overhaul of EV</td></tr> </table>	Category	Scope	Green Investment Tax Allowance (GITA) Assets	Applicable for companies that acquire qualifying green technology assets and listed under the MyHIJAU** Directory Qualifying Assets: EV (electric motorcycle/scooter, bus, MPV/truck) and EV Infrastructure (charging equipment/system)	Green Investment Tax Allowance (GITA) Projects	Applicable for companies that undertake qualifying green technology projects for business or own consumption	Green Income Tax Exemption (GITE) Services	Applicable for qualifying green technology service provider companies that are listed under the MyHIJAU Directory Qualifying Services: EV services related to installation, maintenance and repair of EV charging equipment, infrastructure and EV charging station, services related to operation of the EV charging station and services related to maintenance, repair and overhaul of EV
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Table 5: EV-related Incentives in Malaysia

\*subject to Automotive Business Development Committee's assessment

\*\*MyHIJAU Mark is Malaysia's official green recognition endorsed by the Government of Malaysia, bringing together certified green products and services that meet local and international environmental standards under one single mark.

Promoting Green Initiatives: National Green Standards for transport operators will be imposed to expedite the implementation of green practices in the transport and logistics sectors. Incentives will be provided to encourage the adoption of these standards.

The Sustainable Energy Development Agency (SEDA) has several programmes to promote RE, in particular PV, with feed-in-tariffs (FITs) and FC storage programmes.

The following are some EV-related non-tax incentives, both already in implementation or in the pipeline:

No	EV-related Non-tax Incentives on-going/in the pipeline
1.	EV Priority Parking
2.	Incentives for toll rebates discount

Table 6: EV-related Non-Tax Incentives in Malaysia

### Electric Motorcycles

Due to relatively low-cost, flexibility and economic use of fuel, motorcycle is one of the most popular modes of transportation among road users in Malaysia

Local production of electric motorcycles are led by 2 companies - Malaysian design and manufactured model by Eclimo Sdn Bhd and Treelektrik. Eclimo reporting leasing over 800 units of Electric motorcycle for KFC food deliveries, Royal Malaysia Police, and City Councils in Melaka, Selangor and Penang. The upcoming project is on leasing of the electric motorcycles to Grab Food delivery services. They are also producing battery pack technology and its direct-drive electric motor, both of which have been successfully commercialized. Recently, Eclimo Motors partnered with NanoMalaysia Berhad to launch ES-11 model Nano-Based Lithium-Ion Battery Cell that has a life cycle of 1,000 charges and each charge will enable a travel distance of 100 kilometers (km).

DHL eCommerce provides nationwide domestic delivery with fully owned operations in Malaysia has rolled out a fleet of electric vehicles in Malaysia. There is plan for delivery hubs in Puchong and Cheras in Malaysia to be retrofitted with electric charging points with fast charging capabilities.

### **Electric Buses**

LCMB recognises mass transit as a form of low carbon transportation mode. Therefore, Malaysia is targeting on achieving 10,000 electric buses in Malaysia by 2030 alongside the necessary mass infrastructure and charging stations.

In the past, there were a number of programmes focusing on electric buses. National Key Economic Areas (NKEA) Entry Point Project on Electrical and Electronics among others promoted pilot projects on the adoption of electric bus and demonstration projects were undertaken by various local universities as well as bus operators such as Bus Rapid Transit (BRT) Sunway, Putrajaya Nedo, Kuching Metro and Iskandar Malaysia Bus Rapid Transit.

BRT Sunway Line, a bus rapid transit (BRT) line that is part of the Klang Valley Integrated Transit System servicing the southeastern suburbs of Petaling Jaya was rolled out in 2015. The first elevated BRT in Southeast Asia introduced 15 electric buses that has resulted in 381.73 tonne CO<sub>2</sub> emission avoidance based on total kilometre travel of 3,502,073 km from June 2015 to October 2019.

Putrajaya Nedo, on the other hand, introduced 10 units of single decker EV city buses in 2017, 1 unit of single decker prototype rescue EV bus in 2020 and 2 prototype units of double decker EV city buses in 2021. Its super quick charge chargers are running its 5<sup>th</sup> year without any breakdown. This reliable charging infrastructure technology provides 20 minutes to full charge for every 80km, suitable for the intended fixed routes city buses. The life cycle cost of these EV buses indicated lesser cost than diesel (Euro 3-6 and CNG (Euro 3-6). The development by local private, public and academics sectors as well as localisation of its supply chain and vendors provided significant impact towards Malaysia's vision of becoming technology developer.

Meanwhile, Kuching Metro is stage government initiatives for tourism, providing fee of charge services. The pilot operation begun in 2019 and complete roll out commenced in early 2021. The electric consumption and low maintenance cost of its 12-meter electric buses indicated 3-4 times lower cost compared to diesel buses.

In term of electric buses technologies, leading manufacturing companies such as New Energy and Industrial Technology Development Organization (NEDO), China's Foshan Feichi Automobile Manufacturing Co Ltd., and BYD K9 have launched their technologies in Malaysia. As for local manufacturers, there are several companies such as SKS Bus Manufacturing, Go Auto Manufacturing, Gemilang Coachwork.

Tenaga Nasional Berhad has also implemented a trial of three electric buses at the Universiti Tenaga Nasional (UNITEN) under UNITEN Smart UniverCity, a project that aims to create a unique campus experience by enriching students, staff and visitors experience through the application of technology to improve lifestyle, to reduce carbon footprint and innovate solutions for industry.

AMDAC, a Malaysian incorporated company, is another key player involved in the local manufacturing of specialized vehicles, e-buses, energy storage systems and battery manufacturing. In 2013, AMDAC began the production of the BYD K9 e-bus for local trials; the 29-seater bus costs around RM 1.4 million per unit (US\$ 380,000). Other EV Bus assembler includes Scomi Engineering, Sync R&D and Deftech Sdn Bhd.

For electric buses, charging infrastructure aspects that are important for consideration are easy usage, quick accessibility and relatively inexpensive. Among type of charging depot considered by many bus operators are slow charging, slow charging with DC replenishment, fast charging and pantograph. There are multiple challenges as well as benefits for this charging infrastructure. Demonstration projects are required to pilot test and assess most practical option.

### **EV Charging Infrastructure**

The lack of charging infrastructure is among top barriers for EV adoption as potential buyers are concerned about availability of chargers and the time of charging especially for limited range EVs that might not be able to fulfil the need for long distance travel as well as those staying in high-rise buildings.

Public chargers' deployment in Malaysia is mainly driven by the Government. Since 2015, substantial funding was allocated from Malaysian Electricity Supply Industries Trust Account (MESITA) through MGTC's ChargeEV for the rolling out of EV charging infrastructure across Peninsular Malaysia. MGTC partnered with The New Motion, Netherlands based company for the charging solution and technical expertise, as well as for stimulation of local manufacturing of charging hardware, related sub-industries and component. To further spur the private sectors' participation, ChargeEV has cooperated with BMWi to form the ChargeNow mobility service to share the charging infrastructure.

Today, there are over 500 charging stations nationwide, which are predominantly AC slow chargers at selected malls, showroom/service centre, petrol stations and highway R&R. Some of these charging stations are offering membership cardholders access to the facilities free of charge. The current number of charging points is still insufficient to support the increasing number of EVs.

Type	ChargeEV	BMWi	GoEV	JomCharge	Park Easy	Nichicon	Exicom	ABB	Others	Total
AC	326	70	33	40	10	0	2	0	20	501

DC	1	0	0	5	0	1	1	1	0	9
Total	327	70	33	45	10	1	3	1	20	510

Table 7: Current number of EV Charging by Type and Ownership

Source: KASA (2021)

MARii and Malay Vehicle Importers and Traders Association of Malaysia (Pekema) has announced a partnership to set up 1000 EV charging stations (DC rapid chargers) around the country by 2025. This includes the plan to co-develop connective applications that include e-payment, charger locators, battery management systems and service centre networks for the charging ecosystem.

Meanwhile, Tenaga Nasional Berhad (TNB), Malaysian multinational electricity company, the only electric utility company in Peninsular Malaysia and the largest publicly-listed power company in Southeast Asia has undertaken multiple R&D projects through its subsidiaries such as TNB Research Sdn Bhd and Universiti Tenaga Nasional (UNITEN). The following are the among the projects related to EV charging that are on-going/completed:

1. Development of Fast EV Supply Equipment (EVSE) with Solar PV and Battery for Deferral of Distribution Network Upgrades;
2. Research on Green EV Charging Station for Highway Application in Malaysia;
3. Research on Forecasting Consumer Demand and Behaviour Towards EV Charging Infrastructure Deployment by TNB;
4. Investigation of Technical Impacts of EV Charging to Distribution Network;
5. Development of EV Charger with Voltage Regulation;
6. Development of a Bi-directional Charger for V2G Application;
7. Optimal Control of Multilevel EVs Infrastructure Integrated with PV System;
8. Design and Development of Wireless EV Charger; and
9. Spatial and Temporal Modelling of EV for Charging Station Placement and Sizing in Urban Areas

Despite efforts by public and private sector players, policies and regulations have yet introduced to support the implementation of smart charging especially bi-directional charging and adoption of renewable energy due to the lack of demonstration to understand localisation of technology, impacts on the local and national grids as well as the implications on the public and private fleet adoption, including consumer behaviour. In addition, the current mechanism of public EV charging provided for free would likely be unsustainable in the long run without a viable business model for cost-recovery, also in view of the high operation and maintenance cost of the public chargers such as the cooling systems (for Direct Current Fast Charger (DCFC), software upgrades, repairs, controls, and cleaning tasks and operating.

Another significant opportunity is to introduce battery swapping or leasing in the market as an alternative to the battery charging/recharging method. for battery leasing and swapping for EV.

Therefore, this project would close the gap in knowledge, promote understanding among stakeholders and provide strong base for the country in formulating relevant policies and regulations by preparing implementation guidelines and standards for smart charging to maximize renewable energy for charging and harmonization of electric vehicle supply equipment. Demonstration project to test out the business model and technological solutions of battery

swapping for EV will also be beneficial for Malaysia as proof of concept (Please see Project Component 2.1.3 for further elaboration on this topic).

## EV Standards and Guidelines

Numerous Malaysian standards and regulations have been developed for EV passenger cars and motorcycles, components in EV and testing standards for lithium-ion batteries. Some of these are already gazetted through National Standards Committee and its Technical Committees.

While some standards are already in development, standards and regulations to support implementation of smart charging as well as EV battery repurposing and disposal have yet to be initiated.

## EV Batteries

In response to strong indication of setting up of CKD facility for EV segment by some OEMs in Malaysia, there are plans in discussion for the expansion of EV battery manufacturing by existing battery players and auto parts suppliers such as Samsung SDI Energy Malaysia Sdn Bhd and Go Charge Go Asia (GCG Asia) Malaysia. Samsung SDI Energy Malaysia Sdn Bhd, for instance, has been producing lithium-ion batteries for several years in their Senawang plant in Negeri Sembilan and materials required such as copper coils and solutions are locally available in the country. At present, this company is already producing lithium cells for EVs. GCG Asia, an auto parts supplier, is expanding into EV battery manufacturing to supply to automakers and assemblers in Southeast Asia.

Under the purview of Ministry of Science, Technology and Innovation (MOSTI), among the initiatives embarked by local institutions are National Energy Storage Technology Initiative (NESTI), Enabling Mobility Electrification for Green Economy (EMERGE) and Rapid Electric Vehicle Innovations Validation Ecosystem (REVIVE). As a move to localize EV technology, University Malaya Power Energy Dedicated Advanced Centre (UMPEDAC, UM) is conducting research on Mobile Hybrid Energy Storage System for Emergency Power Dispatch and Grid Support. The project covers the attention to energy solution that can help to increase grid reliability and resilience energy power that can support the grid.

Malaysia Automotive Robotics and IoT Institute (MARii) is an agency under the Ministry of International Trade and Industry (MITI) that serves as the focal point, coordinating centre and think tank towards enhancing the competitiveness of the automotive industry and overall mobility, through adoption of robotics & IoT. EV Interoperability Centre (EVIC) ? a shared test center for the development of EVs and EV-related products and systems. In addition, MARii ventured into numerous collaborations with Malaysian institutions of higher learning such Universiti Teknologi MARA (UiTM), Universiti Kebangsaan Malaysia (UKM), and Universiti Putra Malaysia (UPM) for the development and commercialisation of EV powertrain, EV Wireless Charging System and EV batteries with focus on battery performance, battery replication, and the development of a lithium-ion (Li-ion) battery production line.

Local players for energy storage (battery) management includes Eclimo Sdn Bhd, AMREC SIRIM, TNBR QATS Sdn Bhd, Microvast and Renewcell Sdn Bhd. Eclimo, in particular, has developed

electric scooters using their patented lithium-ion battery technology (on battery packaging). Together with NanoMalaysia Bhd, the company has recently launched an electric motorbike ES-11 model with a nano-structured Battery Monitoring System (BMS) and has appealing features such as the ease of charging via its 3-pin plug socket charging system to address the lack of infrastructure and charging stations. Besides being used as a mode of transport, the model has been tested at commercial-scale to also manage delivery of goods (food, frozen food, groceries, medicinal and pharmaceutical products and eCommerce parcels). Through its leasing business model and subscription basis, Eclimo has previously leased their fleet to KFC Holdings Malaysia Bhd and Royal Malaysian Police, and currently in negotiations with e-hailing services as well as expanding their electric 2-wheeler for renting in city e-mobility space.

With regards to end-of-first-life of EV batteries, Malaysia presently is without policy, regulations and framework for managing any projected growth in EV battery disposal and the necessary ecosystem to support the reuse and recycling (Please see Project Component 2.1.2 for further elaboration on this topic).

**c) the proposed alternative scenario with a brief description of expected outcomes and components of the project;**

The proposed project's overall objective is to realize the full potential benefits of EVs for contributing to GHG emission reductions in the transportation sector in Malaysia. This will be achieved through addressing gaps and barriers to EV adoption and production in Malaysia identified in the previous sections with the support of GEF funding. While Malaysia has made progress with respect to electric mobility adoption, additional support is necessary to accelerate the rate of adoption and support decarbonisation of the transport sector beyond the existing baseline. The project has 4 specific objectives aimed at addressing the identified gaps and barriers:

First, the project aims to support wider adoption of EVs in Malaysia, through 1) improving policy and institutional framework to address barriers on both electric mobility adoption and smart charging infrastructure; and 2) pilot demonstrations of the use of EVs and smart charging infrastructure integrated with renewable energy systems.

Second, the project aims to enhance a business sector ecosystem for EVs and sustainable batteries in Malaysia, through 1) improving policy and regulatory framework for EV value chains, and 2) demonstration of innovative electric mobility solutions.

Third, the project aims to support the sustainable use of batteries through 1) enhancing policy and regulatory framework to address life cycle issues of batteries; 2) developing value chains responsibly; and 3) demonstrating the application of second life EV batteries through battery repurposing and recycling.

Finally, the project aims to scale-up the project's activities across Malaysia, regionally, and internationally through engagement with local, regional and global platforms dedicated to electric mobility.

The project consists of 4 components of which the first 3 components address each of the specific objectives above, while the fourth component focuses on monitoring and evaluation to ensure that the project's objectives will be met.

#### **Component 1: Strengthening the national policy and institutional frameworks into implementation of up-scaling electric mobility adoption and sustainable battery use**

In the transport sector, EV is widely accepted as the next technology paradigm, capable of solving the environmental problems associated with conventional internal combustion engine (ICE) vehicle. However, there are gaps in policy, regulation and technical challenges to the scale-up of EVs in Malaysia, specifically with respect to ensuring charging infrastructure is supporting by sustainable energy, enabling the electrification of public transport and freight, the sustainable use of batteries and supporting a national ecosystem for EV manufacturing and value chain development.

In Malaysia, EV charging infrastructure is mainly supported by fossil fuel sources of energy. There is also no electricity tariff for transport and the relatively affordable price of gasoline in Malaysia for ICE vehicles provides less economic incentive for consumers to shift to EVs. Therefore, there are urgent needs to ensure that the charging infrastructure is supported by sustainable clean energy, the growth does not place drastic burden on national and local grids, and the co-benefits of bi-directional charging are recognized.

There is also a need to ensure that the safe reuse and disposal of EV batteries is accounted for as the EV sector grows. There is potential for second life EV battery storage system to support the RE-based charging infrastructure. Technologies such as battery swapping need to be explored for Malaysia. This project will specifically be addressing these gaps.

Component 1 of the project will lead to policy intervention based the deliverables (studies, guidelines and standards) that will accelerate the adoption of EV in the country and eventually update the national targets of usage of EV. This project will also have opportunity to contribute to new national targets to be set during midterm review of the Malaysian Low Carbon Mobility Blueprint, of which, the identified Executing Partner, Malaysian Green Technology and Climate Centre (MGTC), is responsible for implementing.

Adoption of EV will also be accelerated through pioneering the development of Electric Vehicle Interoperability Centre (EVIC) in Malaysia as a tool for combating climate change and enabling the circular economy in Malaysia.

The Electric Vehicle Interoperability Centre (EVIC) is a centralized facility that will do the following:

1. To reduce and calculate power surge issues by smart grid integration based on real-time energy demand and supply for EV, including well-to-wheel calculation (conversion of emission factor sourced from the power generation, grid distribution and energy consumption of EV);

2. To research the harmonization of EV charging connectors and inlet (AC/DC charging protocols) by testing them according to domestic and international standards and requirements;
3. To address domestic requirements on EV infrastructure and ecosystem (e.g. charging, battery capacity, energy and thermal management system) by conducting interoperability testing ? grid, vehicle, components; and
4. To conduct testing for validation in terms of safety, functionality and environmental in promoting smart grid integration for other sources of energy such as solar, etc.

Gender dimensions will be considered under each output on this component with the aim to foster gender equality and women's empowerment. This includes considering gender dimensions in policy reviews and involvement of gender experts and groups that promote gender quality and the empowerment of women (GEEW) in policy development.

Gender analysis will be conducted, including consultations with women organizations to understand the needs and priorities of women in this project. This includes consideration for concerns around safety issues, access and usage of the vehicles. Moreover, mechanisms will be developed to address barriers to the inclusion of women experts and entrepreneurs to ensure that women can equally lead, participate in and benefit from the project activities. This includes developing clear and functional guidelines to facilitate gender mainstreaming in business models with consideration for the recruitment, retention and promotion of women within the EV business ecosystem.

Moreover, targeted efforts will be made to identify women experts and women-led organizations to participate in the project. If this is not possible, or only to a very limited extent scholarships will be considered for women students to learn from the project activities. Connections with networking and mentorship programmes for start-up entrepreneurs and SMEs will also be developed under this output and consider the specific needs of women and provide targeted support to women entrepreneurs.

#### **Output 1.1.1**

##### **Implementation guidelines and standards for smart charging to maximize renewable energy for charging and harmonization of electric vehicle supply equipment**

#### **Objectives:**

A barrier to the adoption of policy on smart charging is a lack of understanding on the impact it will have on the grid, as well as a lack of understanding on what regulatory environment is necessary to make smart charging attractive to the private sector for investment. Simulation analysis includes assessment on impacts of smart charging on the electricity grid (generation, transmission, and distribution) and assessment of GHG emissions and socio-economic impacts. It will also assess the implications for harmonization of electric vehicle supply equipment for passenger vehicles, bus and motorcycle. This output will include development of business model and investigates the complementarity potential between variable renewable energy sources and EV, adopting smart charging approaches.

Simulation analysis includes assessment on impacts of smart charging through harmonization of charging protocol on the energy requirements (generation, transmission, and distribution) and assessment of GHG emissions and socio-economic impacts.

The Government has gazetted standards for Energy Efficient Vehicles and Next Generation Vehicles.

No	Activity	Project Output	Budget/Implementation Year					Total
			2022	2023	2024	2025	2026	
1.1.1.1	Development of guidelines/standards for smart charging and harmonization of EV charging protocol	1 Report (development of standards based on the assessment)	50,000					50,000
1.1.1.2	Development of calculation methodology for EV value chain based on Well-to-Wheel concept			50,000				50,000
<b>Total</b>								<b>100,000</b>

Table 8: Budget and implementation for Activities 1.1.1.1 and 1.1.1.2

At the end of the project, the deliverables would include:

1. A document that defines the guideline and/or national standard for enabling the smart charging and harmonization of EV charging protocol;
2. Impact assessment for the adoption of harmonization of EV charging protocol; and
3. Derivation of emission factor for EV value based on Well-to-Wheel concept

The deliverables will be peer-reviewed by external experts and relevant stakeholders in addition to KASA throughout the drafting process before final submission for approval and adoption to ensure and support quality control in the proposed guidelines/standards.

Further, to ensure the country ownership and to have a high level of implementation after the approval and adoption of the proposed guidelines/standards, UNIDO will emphasize its advisory and supporting role, which is to ensure a sound policy formulation process, e.g., public hearing, public-private consultation, stakeholder dialogue, or/and inter-ministerial coordination.

To ensure that the policies, regulations and instruments are gender responsive, social and gender dimensions are being considered during their development. This includes conducting gender analysis, collecting gender disaggregated data during data collection, considering gender dimensions in the surveys and interviews and involving gender experts, gender focal points and/or organizations that promote gender equality and women's empowerment. Moreover, women's organizations will be invited to validate the policies from a gender perspective.

## Output 1.1.2

## **Public transport and freight master plan enhanced based on modelling and scanning of electric drive technology options**

### **Objectives:**

This output will assess the investments involved and policies necessary to shift from diesel-based transport of freight (either trucks or trains) to electric rail transport including the costs and benefits of such a shift, an assessment of GHG emissions, environmental pollutants and socio-economic impacts. This will also include modelling of the investments involved, policies and regulatory necessary to shift of passenger traffic in major cities like Kuala Lumpur to more sustainable modes of transport (from cars to public transport, walking, bicycles, and e-vehicles). The various technologies will be evaluated with an appropriate discount rate to find the financial rates of return on investments, the level of financial and non-financial incentives necessary, and the non-financial benefits.

In line with the National Transport Policy, the mode shift from road to rail is identified to be one of the major strategies in transport development with the intention to increase the nation's overall transport efficiency. This is also in consideration that the mode share for rail-based freight transport only stood at 2% for the land sector. The sole service provider in Malaysia, KTMB only utilises 30% of its infrastructure capacity.

Transport by rail is not only economically cheaper, but with the electrification efforts for the rail infrastructure for both existing and new projects, it would also be more climate change friendly, and with a mode shift to rail for travel and freight, would significantly reduce CO2 emissions. By the same token, maintenance of roads and even accidents, would be significantly reduced in tandem with the reduction of lorries, especially overweight ones, on the road.

New rail infrastructure from ECRL would act as a land bridge connecting Kuantan Port to Port Klang, and with the potential to act as a major catalyst for the economies to transfer goods by rail, would need to necessary infrastructure, clearance processes, cargo handling facilitations and regulatory mechanisms to facilitate this change.

New urban passenger rail services in Klang Valley such as LRT 3, MRT 2 and 3 would also require the necessary facilitations in the overall eco-system so as to increase ridership with the intention to ensure sustainable operations.

### **Study on Mode Shift from Road to Rail**

As part of the Malaysia's Public Transport and Freight Master Plan project, a focused study will be made to produce a roadmap and recommendations to increase the mode shift of both freight and passenger travel from road to rail. The objectives are as follows:

- a) Reduction of CO2 emissions.
- b) Reduction of road congestion, maintenance and accidents (due to poor road conditions)
- c) Increase in freight transport's competitiveness due to its foreseeable lower costs.
- d) Optimise the opportunity of rail being the backbone of public transport and increase overall passenger ridership for land public transport.

e) Optimise the competitive edge of the Port Klang ? Kuantan Port land bridge rail connection via the reduction of travel time via ship.

The study will firstly identify the present mode share of freight movement and passenger movement in comparison to road versus rail transport in Malaysia. From there, gauge the challenges faced on the low uptake of rail transport and look at its overall potential too once present project and potentially future ones take off and in operations. A benchmarking study will also be made to include at least three countries in the world that have successfully made significant shift to rail such as Japan and countries in Europe, in terms of initial settings and challenges, and the Government's and private sectors' initiative to increase it.

The study will then produce a timeline-based roadmap on how to realistically and practically increase the mode share for freight movement and passenger travel and produce recommendations that include, but not limited to the followings:

- a) Policy directions;
- b) Regulatory requirements;
- c) Standard Operations Procedures;
- d) Enforcement requirements;
- e) Financial incentives and/or monetary assistance;
- f) Needed infrastructure (both local and international linkages) that includes locational requirements and planning stages;
- g) Business model, ventures and collaborations;
- h) Business value-chains;
- i) Promotions;
- j) Multimodal tie-ins with port movements (for freight);
- k) Multimodal tie-ins with other public transport services not limited to land based (for passenger);
- l) Trade agreements (for freight);
- m) Technology required for the facilitation; and
- n) Supporting services required for the facilitation, and strategies to attract the services.

For the milestone timelines, the study will also recommend target settings especially mode shift targets for the next 20 years. The study will also produce the benefits that be gained from achieving the targets in terms of:

- ? Economic benefits, and its GDP contribution with the regards to economic gains and reduction of economic losses (e.g., reduction of traffic congestions);
- ? Manpower capacity development;
- ? Technological, or Transfer of Technology benefits;
- ? Expected CO2 reduction compared with Business as Usual (BAU) scenario.

This project will be beneficial to freight companies, rail operators and the nation in general with the reduction of congestion, CO2 emissions, road maintenance.

The study will be peer-reviewed by external experts and relevant stakeholders in addition to KASA throughout the drafting process before final submission for approval and adoption to ensure and support quality control of the study.

The Ministry of Transport has committed to investing in the purchase of six electric train cars as co-financing based on the result of this study. This investment would help the project realize an additional 5,724 tCO<sub>2</sub> in direct GHGs mitigated to what is already presented in Table E.

No	Activity	Project Output	Budget/Implementation Year					Total
			2022	2023	2024	2025	2026	
1.1.2.1	Study on Mode Shift from Road to Rail, including Mode Shift Incentive Scheme	1 Report	50,000	100,000	100,000			250,000
<b>Total</b>								250,000

Table 9: Budget and implementation for activity 1.1.2.1

### Output 1.1.3

#### Development of Electric Vehicle and Sustainable Battery Ecosystem and Value Chain Roadmap

The national EV ecosystem especially at the market end is in the initial growth stage. As described in previous section, the localization of EV manufacturing and value chains within Malaysian automotive industry is still low despite multiple attempts to enable mass EV adoption in the past. Taking cognizance of global trends and market force in EV especially in countries like China, US and Norway as well as EV development in the neighbouring countries such as Singapore, Thailand, Indonesia and Vietnam, the next few years would be critical for Malaysia to position itself strategically in the regional and global EV landscape. The announcement on EV-related incentives for the year 2022 has reignited national efforts to drive EV agenda from all levels - Government and agencies, state Government, the industry, research institutions and the civil society.

Thus, a study on the landscape of development of EV and sustainable battery ecosystem, and value chain roadmap will address the alignment of EV within the automotive industry, against the backdrop of sustainability and low carbon mobility agenda and clean energy sources, and towards enabling technological development of strategic strength to Malaysia. A holistic approach is required to systematically address the challenges, close the gaps and overcome barriers to EV adoption in Malaysia by looking at the entire value chain of EV including EVSE.

The Study will be addressing, but not limited to, the following elements:

1. Governance and Regulatory Framework (including Standards);
2. Research, Development and Innovation (R,D&I) and Technological Development;
3. Economic Instruments;
4. Education, Awareness and Talent Development (including skills, training modules);
5. Network of Infrastructure; and
6. Social and gender dimensions.

The research scope will include the global and regional scenario, EV and sustainable battery ecosystem and value chain roadmap, identifies the growth opportunities and Malaysia's strength in overcoming constraints and threats, profiles and roles of key players (government, academia, industry and civil society) in the EV ecosystem and infrastructure development. All 3 segments of EV will be covered in term of Political, Economic, Social, Technological, Legal and Environmental factors and from the perspectives of automotive and decarbonising of transportation sector. Moreover, the study will be peer-reviewed by external experts and relevant stakeholders in addition to KASA throughout the drafting process before final submission for approval and adoption to ensure and support quality control of the study.

No	Activity	Project Output	Budget/Implementation Year					Total
			2022	2023	2024	2025	2026	
1.1.3.1	Study on the Landscape of EV and EV Battery Ecosystem (including talent, expertise, facilities, etc.)	1 Report	25,000	25,000				50,000
<b>Total</b>								50,000

Table 10: Budget and implementation for Activity 1.1.3.1

## **Component 2: Investment and commercialization of electric mobility technologies**

### **Output 2.1.1**

#### **Development of business models and deployment of renewable energy based smart charging**

##### **Objectives:**

This will involve the implementation of a number of smart-charging trials for electric vehicles linked to renewable energy such as solar PV wherein it is investigated how to best match supply and demand of the electricity system to minimize system costs and GHG emissions. This would include distributed solar photovoltaics for electric vehicle charging and a controller to be developed to analyse the impact of an electric vehicles PV integrated system. The system would look at grid storage batteries accepting electricity from the solar PV and stored in the storage battery during the daytime and recharge the EV from the battery storage during night time. This could potentially also include developing Vehicle-to Grid capacity, wherein the vehicles serve as a battery for grid stabilization (taking off power during low demand times and supply during peak times). This will also include an impact assessment for government fleets, e-buses and e-taxis and linked to government support schemes.

##### **Demonstration Cities**

Based on the stakeholder discussions, strong interest and high potential for replication, three demonstration cities have been chosen at Cyberjaya, Iskandar Malaysia and Kuching. These locations offer unique potential for raising awareness, increase knowledge and multiple stakeholder involvement in the respective places.

## Proof of Value for Electric Vehicle Inter-operability Center (EVIC): Vehicle-to-Infrastructure (V2I) in Cyberjaya

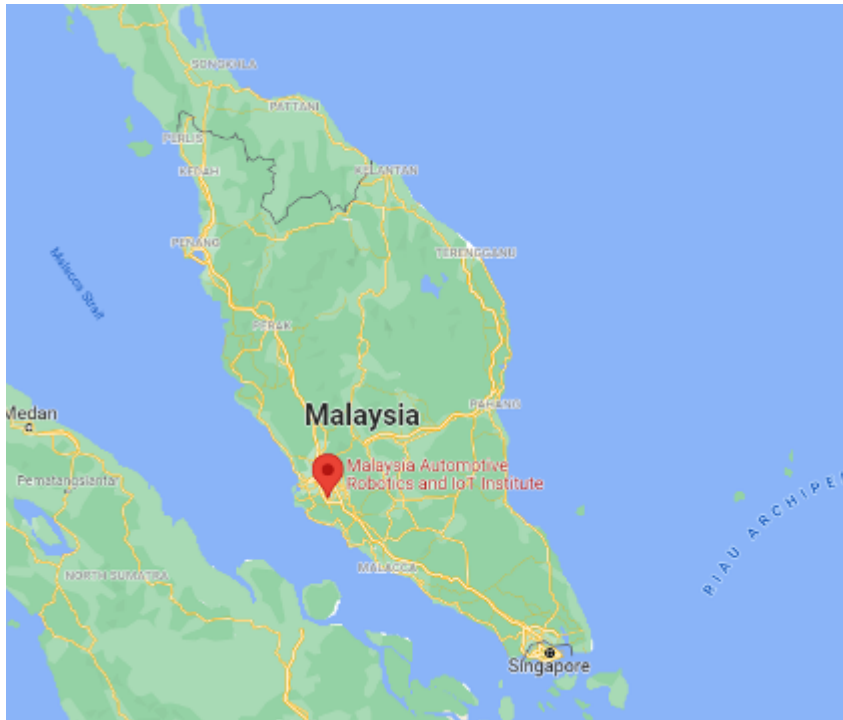


Figure 2: Geographical Location for Proof of Value for Electric Vehicle Inter-operability Center (EVIC): Vehicle-to-Infrastructure (V2I) in Cyberjaya  
(Coordinates: 2.903136, 101.651169)

Cyberjaya is relatively a new development and was launched on 17 May 1997 as a fully integrated City, and Malaysia's pioneer technology hub known as the Multimedia Super Corridor (MSC). In the city's Smart Low Carbon City Action Plan 2025, the document lists Strategy 1: Establish Smart Mobility in the city with 80% coverage of integrated green mobility network by 2025. This includes Key Action 1.3: Making Alternative Vehicle Mode Sharing System Works in Cyberjaya including introducing EV Scooter Sharing Service/Scheme to reduce congestions caused by motorcycles as well as private vehicles and Key Action 1.5 Promoting Clean and Energy Efficient Vehicles through EV charging stations facilities.

Also promoted as a Living Lab to encourage innovation and attract technology start-ups, Cyberjaya offers the entire cityscape for real-life testing including testing of autonomous vehicles (AVs) on two routes stretching 7km in total in Cyberjaya.

LCMB recognises the need for Malaysia to carry out feasibility study and demonstrate advanced EV charging technologies such as wireless, ultrafast charger, V2G and smart charging.

With regards to Vehicle-to-Infrastructure (V2I), EV can improve overall energy efficiency for power generation sector and V2G technology enables EV as a decentralized generation as EV can act as energy storage. The demonstration among others will establish a validation method/procedures to assess the EV interoperability between vehicle and infrastructure in terms of functionality, safety, and environmental.

No	Activity	Project Output	Budget/Implementation Year					Total
			2022	2023	2024	2025	2026	
2.1.1.1	Demonstration of EV smart-charging proof of concept for electric vehicles (for passenger vehicle) linked to renewable energy	1 Report	100,000	100,000				200,000
<b>Total</b>								200,000

Table 11: Budget and implementation for Activity 2.1.1.1

### Renewable Energy Smart Charging Demonstration Project for Iskandar Malaysia Bus Rapid Transit (IRT) in Skudai, Johor

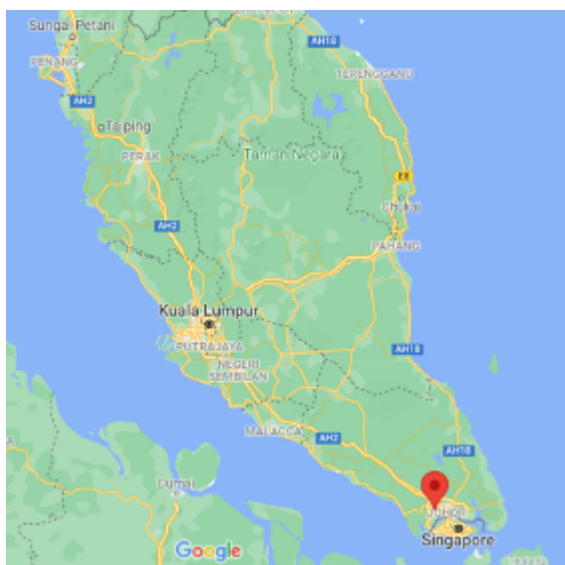


Figure 3: Geographical Location for Renewable Energy Smart Charging Demonstration Project for Iskandar Malaysia Bus Rapid Transit (IRT) in Skudai, Johor  
(Coordinates: 1.5633722817996432, 103.65550075719715)

Iskandar Malaysia is southern development corridor in Johor introduced in 2006 as high-impact development under the 9th Malaysia Plan 2006-2010. It was envisioned that the region to be developed into a prosperous economy of international standing through its vision as Smart City, with green focused agenda driven by Iskandar Malaysia Low Carbon Society Blueprint 2025. The development is planned, promoted and facilitated by Iskandar Regional Development Authority (IRDA) together with National Physical Planning Council, State Planning Committee and local authorities through the adoption of Comprehensive Development Plan. With the land area of 4,749 km<sup>2</sup> and population of over 2 million in 2020, Iskandar Malaysia encompasses of Johor Bahru, Kulai and part of Pontian Districts under the jurisdiction of 5 local authorities namely Johor Bahru City Council, Iskandar Puteri City Council, Pasir Gudang City Council, Kulai Municipal Council, Pontian Municipal Council. Greenhouse gas (GHG) emissions in Iskandar Malaysia have increased by 36.8% from 2010-2017 as a result of the growth in population and rapid increase in total number of vehicles on the road.

For a period of 7 years, the land transport sector was the major contributor to greenhouse gas emissions in Iskandar Malaysia. In 2017, GHG emissions were 4.93 million tons of carbon dioxide equivalent (tCO<sub>2</sub>e) or 30.4% of total emissions.

Johor Bahru, particularly, is one of the fastest-growing cities in Malaysia after Kuala Lumpur. It is the main commercial center for Johor and is in the Indonesia-Malaysia-Singapore Growth Triangle. The city has a very close economic relationship with Singapore. Around 3,000 logistic lorries are crossing between Johor Bahru and Singapore every day for delivering goods between the two sides for trading activities. On top of this, more than 350,000 people cross the border daily for business, education, and leisure activities. This has led to an increase in traffic volumes and road congestion. The impact of increased road congestion has a significant effect, not only on the quality of life or road users due to increased journey times but also a profound effect on the community as whole.

Through the Low Carbon Society research project (2011-2015), substantive research findings were produced that have been translated into workable and bankable development policies and programs which call as Low Carbon Society Blueprint for Iskandar Malaysia (LCSBPIM). In line to this, IRDA has decided to use green technology bus which is electric bus (E-bus) to support Iskandar Rapid Transit operation.

The Public Transport Master Plan for Iskandar Malaysia was established by IRDA through the Iskandar Malaysia Transportation Blueprint 2010-2030, and it has identified a complete BRT busway and service network for the Iskandar Malaysia region. IRDA is the agency responsible for facilitating the project on behalf of the Federal Government and Johor State Government.

As such, Iskandar Rapid Transit (IRT) (formerly Malaysia Bus Rapid Transit, IMBRT) was launched in 2017 as a bus rapid transit system consisting of trunk route (articulated 18m), direct (12m bus), and feeder bus (8m bus) rapid transit corridors in Iskandar Malaysia. A total busway length of 55 kilometers of BRT lines has been established and is divided into three primary alignments which are:

- ? Iskandar Puteri Line (Anjung to Skudai Kiri)
- ? Skudai Line (Jalan Tun Abdul Razak to UTM Skudai)
- ? Tebrau Line (JBCBD to Desa Jaya)



Figure 4: 3 BRT Trunk Lines within Iskandar Malaysia

The Iskandar Rapid Transit operations will be run from the BRT Control Centre (BCC) located at the BRT depot in UTM.



Figure 5: Potential clean energy mixed fleet operations for Iskander Rapid Transit Fleet

Upon completion of development planning, land acquisitions and stations design, IRT Pilot Testing Programme was launched in 2021 under IRT Phase 1 with 90% coverage of Iskandar Malaysia population to demonstrate the use of fully-electric bus prototype and biodiesel-based green technology busses from nine bus suppliers.

Iskandar Malaysia as one of participating cities for UNDP-GEF Green Technology Application for the Development of Low Carbon Cities (GTALCC), was also involved in the pilot project to support the scaling up of low carbon public transport systems. The pilot project is expected to facilitate bus operators to evaluate low carbon bus investments since the initial costs of electric buses are substantially higher than standard diesel buses. The adoption of electric bus in Malaysia is in line with LCMB target of 10,000 electric buses in Malaysia by 2030 as well as National Electric Bus Roadmap for the National Transport Policy 2019-2030 currently in development.

Since IRDA already decided to use E-bus for Iskandar Rapid Transit operation, infrastructure must be ready to support the operation of E-bus. One of the infrastructures that must be ready is charging facilities for the E-bus. IRDA has identified several potential locations to install and build smart charging facilities in this project. One of the proposed locations is at UTM depot of which land was already acquired for this development purpose.

IRDA has also discussed with several potential partners about smart charging facilities regarding the possibility of using solar technology. All those solar panel will be installed on the rooftop of depot and stations.



Figure 6: Proposed Location for demonstration at UTM Depot, Skudai

It is planned for Public Private Partnership (PPP) where the investment come from private funding. However, the details of this business model not been finalized yet and still under review and discussions. We anticipate introducing "Ebus Contracting Model" where the assets and infrastructure will be owned by the Government to help improve the level of service efficiency by bus operators. This may reduce the financial burden on operating cost for the bus operators. With bus and charging facilities are owned by government agencies, then the competition, efficiency and responsiveness of bus operators can be enhanced in the public transport services industry.

The people of Iskandar region particularly and Malaysians in general will receive these benefits with the carbon emissions reductions because of this project. A healthier lifestyle can be improved while enjoying a more efficient and environmentally friendly transportation system. In addition, with the introduction of new e-bus technology, it is expected to have spillover effect to the local industries especially on research and development, manufacturing, and maintenance.

In this project, equal opportunities to lead and participate in and benefit from activities will be fostered. The opportunity will be given to anyone who is interested and qualified to participate regardless of age, gender, race, and religion while steps taken to identify and address barriers some groups have to participation. The project will endeavor to create more opportunities for female and people with disabilities to participate in the R&D, operations, and maintenance.

No	Activity	Project Output	Budget/Implementation Year					Total
			2022	2023	2024	2025	2026	

2.1.1.2	Study on inventory of carbon emissions before and after deployment of e-bus and smart charger, including Solar Smart Charging specification (with possibility for multi-use charging)	1 Report	50,000					50,000
2.1.1.3	Installation of Solar Smart Charging demonstration units with three main components: solar PV panels (capacity to be determined by the space), battery storage (the battery to utilize EV second life) and fast chargers (plug in for multi-use other than for the e-buses)	1 Demonstration		150,000	150,000			300,000
<b>Total</b>								<b>350,000</b>

Table 12: Budget and implementation for Activities 2.1.1.2 and 2.1.1.3

#### Solar Smart Electric Bus Charging Infrastructure and Depot Demonstration for Metro Kuching at Demak Laut Industrial Park, Kuching, Sarawak



Figure 7: Geographical Location for Renewable Energy Smart Charging Demonstration Project for Kuching Metro at Demak Laut Industrial Park in Kuching, Sarawak  
(Coordinates: 1.5928386316765086, 110.40893616062701)

City of Kuching is the capital city of Sarawak located in East Malaysia and the only city in Malaysia administered by local authorities, Kuching North City Hall and Kuching South City Council. With an area of 1,869 sq km, the city is the most populous district in Sarawak.

In 2017, Sarawak government made a historical milestone in bringing Sarawak towards a sustainable, liveable, and smart & an advanced society through its visionary move on adopting clean energy buses in the public transportation system for Kuching. The initiative is aligned to the state government's focus on responsible tourism under Sarawak's Economic Action Council Tourism Aspiration for Sarawak to be a leading destination for eco-tourism and business events in the ASEAN region driven by empowered communities to conserve heritage, culture, biodiversity and to promote investment and development through responsible actions, by 2030.

Through this strong synergistic leadership by the state government and relevant state organizations, Kuching Metro Electric City Bus was launched in 2018 and the first trial run was implemented in 2019 for free green energy bus services through the introduction of 1 unit of battery-powered electric bus. The feedback and response from commuters were extremely well received.

Upon the success of this 10-month pilot project, a total of 4 units of 12-meter new electric buses commenced its operation in 2020 and only officially launched in March 2021 due to COVID-19 pandemic. The 6 trips service operated at 6.00 am to 7.00 pm daily with 120 minutes interval time across 107 bus stops on a new route, Route No. 103 DUN ? Semenggoh Wildlife Centre. In addition, mobile application feature was also introduced to allow real time monitoring of the location and estimated timing of bus arrival. The service is provided free of charge to all locals and tourists.

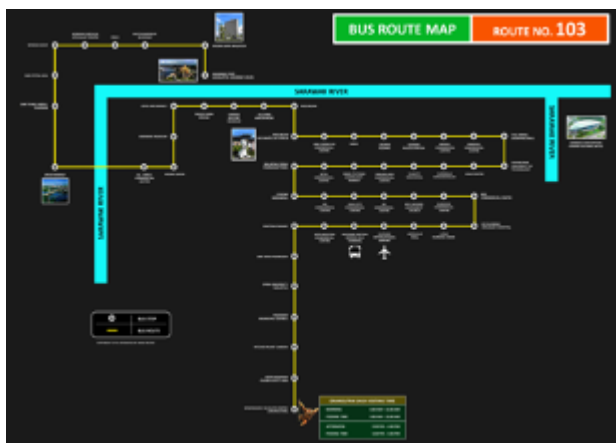


Figure 8: Route No. 103 DUN ? Semenggoh Wildlife Centre for Kuching Metro Electric City Bus



Figure 9: Map of Route No. 103 DUN ? Semenggoh Wildlife Centre for Kuching Metro Electric City Bus

Kuching Metro Electric City Bus is operated by Henz Pacific Sdn Bhd, a local bus operator with more than 30 years of experience. Based on the assessment by Henz Pacific, the efficiency and reliability of the daily bus operation is determined by a good commitment and dedication of its technology and bus manufacturer partners especially on ensuring that the battery technology and the charging station technology are operating smoothly. The overall energy consumption and running cost of the electric buses are 3-4 times lower compared to diesel city bus.

The electric bus operation brings about positive impacts to the commuters as well Kuching as a whole. Besides zero carbon emission and lower noise pollution, this green fleet is attracting more ridership and elevating image of responsible corporation in environment conservation, contributing towards the nation's goal on carbon neutrality by 2050.

Despite the positive outcomes, the operation is not spared from on-going challenges. One of its challenges is the limited number of charging locations whereby the charging station could only cater to two buses at one time. This restricts the expansion of operation.

Therefore, Smart Charging infrastructure is proposed as demonstration project with charging infrastructure technology to be considered to reduce charging time. This will be integrated in the new electric bus depot in Kuching planned in the near future.

No	Activity	Project Output	Budget/Implementation Year					Total
			2022	2023	2024	2025	2026	
2.1.1.4	Study on Solar Smart Charging specification for Electric Bus	1 Report	15,000					15,000

<b>2.1.1.5</b>	Installation of Solar Smart Charging demonstration units with three main components: solar PV panels (capacity to be determined by the space), battery storage (the battery to utilize EV second life) and fast chargers (plug in for multi-use other than for the e-buses)	1 Demonstration		155,000				155,000
<b>Total</b>								170,000

Table 13: Budget and implementation for Activities 2.1.1.4 and 2.1.1.5

These Solar EV Charging demonstration sites will serve as input for testing and the collection of data and information for Component 1.1.1.

## Output 2.1.2

### Demonstration of electric vehicles battery repurposing and recycling

#### Objectives:

In connection with output 1.1.3, this output will involve a demonstration and support for the re-use of EV batteries, for example as batteries for PV electricity production which could be then used for later EV charging or feed into the grid during peak demand times. Linkages may potentially exist with 2.1.1 however this output also looks beyond reuse but will also link with the new Advance Automotive Treatment Facility to showcase options for EV battery recycling.

EV battery second life applications through repurposing could provide closed-loop solutions in EV industry eliminate GHG emissions used to dispose of the old cells and slows down the rate of resource exploitation in the extractive industry. This approach solidifies Malaysia's commitment to circular economy, ensuring that batteries are recovered and reused to support clean and sustainable transportation, in line with 12th Malaysia Plan focus on embracing circular economy, Blueprint of Circular Economy to be introduced in the near future, and National Policy of Remanufacturing that focuses on Automotive as one of its main sectors focus.

As such, this project will enable the development of EV battery repurposing and recycling value-chain and provide the necessary local capacity and competencies to local players in Malaysia including research institutions, licenced facilities under AATF programme, technology and solution providers.

Activities include the following:

1. Conduct Study on the Landscape of EV Battery Ecosystem

2. Develop Standards and Guideline for EV Battery Recycling and Repurposing in Malaysia
3. Deployment of Technology Solutions
  - ? Testing to evaluate battery State of Charge (SoC) and State of Health (SoH)
  - ? Development of prototypes for second life applications including performance testing and safety aspects
  - ? Deployment of prototypes

The project will also actively engage women as experts in this area. Where women cannot be identified, the project will bridge the gap by exploring options for training for women technicians or scholarships for women students to participate.

### **Demonstration Site**

### **Development of EV Battery Repurposing and Recycling Value-Chain and Demonstration Project on Remanufacturing of EV Battery**



Figure 10: Geographical Location for Remanufacturing of EV Battery Demonstration Project in Cyberjaya

(Coordinates: 1.5633722817996432, 103.65550075719715)

In Malaysia, Authorised Automotive Treatment Facility (AATF) programme was introduced in early 2021 to properly and sustainably dispose of End-of-Life Vehicles (ELV). There are more than 60,000 abandoned cars nationwide as reported by Road Transport Department and bio-hazardous components such as batteries extracted from these abandoned cars are under the purview of Department of Environment (DOE) as Scheduled Waste, unless specified by MARii.

Looking ahead, Malaysia will face an impending issue of EV battery waste with over 30,000 cumulative number of registered electric passenger cars in Malaysia to-date and expected to reach 800,000 in high scenario EV projection in 2030. At present, the number of decommissioned EV batteries has reached thousands and owners of batteries that include individuals and automakers in Malaysia opted to partner with recycling companies to manage the safe disposal or shipment of these batteries for recondition work or material recovery to facilities outside of Malaysia.

Mechanisms need to be developed to ensure that Malaysia has the capacity to conduct safe recycling of damaged EV batteries. On the other hand, discarded EV batteries that are not faulty has unrealized value as these batteries can still retain approximately 70% to 80% of its usable charging capacity and are always of a very high quality, durable and superior to consumer batteries in term of energy and power density. Automotive manufacturers expect an EV battery's end of first life to occur after about 6-8 years of operation. International Council on Clean Transportation (ICCT) reported that second-life battery and recycling of battery can lead to a reduction of life cycle carbon emission by 22% and 4%, respectively.

Therefore, further use in second life applications through repurposing could provide closed-loop solutions in EV industry eliminate GHG emissions used to dispose of the old cells and slows down the rate of resource exploitation in the extractive industry. This approach solidifies Malaysia's commitment to circular economy, ensuring that batteries are recovered and reused to support clean and sustainable transportation, in line with 12th Malaysia Plan focus on embracing circular economy, Blueprint of Circular Economy to be introduced in the near future, and National Policy of Remanufacturing that focuses on Automotive as one of its main sectors focuses.

As such, AASCT project will enable the development of EV battery repurposing and recycling value-chain and provide the necessary local capacity and competencies to local players in Malaysia including research institutions, licenced facilities under AATF programme, technology and solution providers.

The deployment of technology solutions for EV battery repurposing would include:

- ? Testing to evaluate battery State of Charge (SoC) and State of Health (SoH)
- ? Development of prototypes for second life applications including performance testing and safety aspects
- ? Deployment of prototypes

The project will also actively engage women as experts in this area. Where women cannot be identified, the project will bridge the gap by exploring options for training for women technicians or scholarships for women students to participate.

The proposed demonstration site for the demonstration project will take place in Cyberjaya, under the purview of MARii.

No	Activity	Project Output	Budget/Implementation Year					Total
			2022	2023	2024	2025	2026	
2.1.2.1	Develop Standards and Guideline for EV Battery Recycling and Repurposing in Malaysia	1 Demonstration	20,000	30,000				50,000

<b>2.1.2.2</b>	Deployment of Technology Solutions (including proprietary technologies, experts, facilities and space, operation and maintenance, management and administration etc.) ? Testing to evaluate battery State of Charge (SoC) and State of Health (SoH)			50,000	25,000			75,000
<b>2.1.2.3</b>	Deployment of prototypes for EV battery second life applications			50,000	25,000			75,000
<b>Total</b>								<b>200,000</b>

Table 14: Budget and implementation for Activities 2.1.2.1, 2.1.2.2 and 2.1.2.3

### 2.1.3 Deployment of Electric Vehicle Battery Swapping Technology

Swappable EV battery enables cost reduction and convenience for buyers, eliminates concerns about range, charge time and finding recharging points, allows cheaper off-peak hours charging, and provides alternative for managing battery packs through battery leasing. Hence, encourage EV ownership.

Electric motorcycle segment for the urban setting is leading the adoption. Riders could swap out depleted batteries for fully charged ones at switch stations.

Among electric motorcycle companies offering battery swaps are Honda, Gogoro, and Kymco.

Taiwan's Gogoro (founded in 2011), market leader for electric motorcycles has a mature battery-swapping infrastructure in place and is expanding its market e.g., Gojek x Gogoro pilot in Indonesia.

Singapore EV battery start-up, Oyika (founded in 2018), non motorcycle manufacturer offering battery swapping solutions through subscription plan has penetrated Cambodia and Indonesia, and partnering with Yinson Holdings Bhd to roll out the technology in Malaysia. Ni Hsin Group Bhd partnership with MNA Energy Sdn Bhd (MNAE) is implementing SmartSwap programme in Malaysia.

Honda, Yamaha, Kawasaki and Suzuki established a consortium in 2019 to develop a standardised set of specifications for electric motorcycle batteries.

Lack of consistent standards for batteries, cost of the infrastructure and enormous investment by a manufacturer to ensure enough batteries in circulation are challenges to adoption of this technology.

AASCT demonstration project will increase our knowledge and understanding on the technology application, explore feasible business models and enables standards and guidelines development of battery swapping system for Malaysia as well as to promote public awareness and education on the feasibility of EV battery swapping technology.

The project will also actively engage women as experts in this area. Where women cannot be identified, the project will bridge the gap by exploring options for training for women technicians or scholarships for women students to participate.

No	Activity	Project Output	Budget/Implementation Year					Total
			2022	2023	2024	2025	2026	
2.1.3.1	Demonstration on EV Battery Swapping Technology for Motorcycle	1 Demonstration	30,000	40,000				70,000
2.1.3.2	Development of Standards and Guideline for EV Battery Swapping	1 Report		10,000				10,000
<b>Total</b>								80,000

Table 15: Budget and implementation for Activities 2.1.3.1 and 2.1.3.2

### Component 3: Capacity building and scale-up

#### Overview of objectives and expected outputs

This component aims to contribute to the scale-up of other components of the projects nationally through capacity building and knowledge sharing on outputs of Component 1 and 2, in order to accelerate the adoption of EVs.

Therefore, the knowledge, experiences, and lessons learned from Component 1 and 2 will be integrated as content of Component 3 and will be shared across national, regional, and global networks through the below outputs of this component. The project will also share project deliverables such as analytical reports, policies, business models and lessons learned with the Global Program in order to support scale-up and replication of e-mobility in other countries and regions.

Participation in regional and international platforms may include participation in any EV-related programmes by UNIDO, UNEP global e-mobility programme such as Global Working Groups/EVI meetings, activities of the EV30@30 and Global EV Pilot City.

No	Activity	Project Output	Budget/Implementation Year					Total
			2022	2023	2024	2025	2026	

3.1.1.1	Targeted training for municipal governments and private sector on electrifying fleets, charging infrastructure and sustainable use of batteries	Series of training conducted		5,000	5,000	5,000	5,000	20,000
3.1.2.1	Training / workshops supporting development of electric vehicle and sustainable battery ecosystem and value chain with a focus on women participation	Series of training conducted		5,000	5,000	5,000	5,000	20,000
3.1.3.1	Knowledge exchange and scale-up through participation in regional and international platforms	Study and Work Missions		20,000	20,000	20,000	35,000	95,000
<b>Total</b>								<b>135,000</b>

Table 16: Budget and implementation for Activities 3.1.1.1, 3.1.2.1 and 3.1.3.1

#### Component 4: Monitoring and Evaluation

##### Overview of objectives and expected outputs

This Component aims for UNIDO to regularly monitor progress on each component to ensure the project is completed following the time plan and the budget allocated, as well as to be responsive and proactive about any potential adjustment or opportunities that arise that can further leverage the GEF grant for achieving additional GEBs.

Outputs under this component include regular monitoring and mid-term project review in the third year of the project period, and a terminal project evaluation. As per GEF and UNIDO guidelines, an independent terminal project evaluation will be conducted at the conclusion of the project to glean best practices and lessons learned for future projects.

All monitoring and evaluation tools and documents, such as the monitoring plan, ESMP, gender plan, stakeholder engagement plan, progress reports, final evaluation report, and thematic evaluations (e.g. training needs assessment), will include gender dimensions, and report with respect to an established baseline for gender related targets in the gender mainstreaming action plan.

#### 4.1.1 Monitoring and mid-term project review

This output includes the following activity:

##### 4.1.1.1 Conduct an independent mid-term project review

In addition to monitoring of the progress of the project regularly, this activity will conduct an independent mid-term project review in order to evaluate the progress of each component against project indicators, and to provide recommendations to the project both content wise, timewise, and budget wise for improvements of the project in the second half of the project period.

This activity will be conducted in the third year of the project period.

#### 4.1.2 Project terminal evaluation

This output includes the following activity:

##### 4.1.2.1 Conduct an independent terminal project evaluation at the end of the project

This activity will conduct an independent project evaluation at the end of the project period to evaluate the progress and success of each component of the project and the whole project, including the impact of the project at the demonstration sites and at the national level, and to glean lessons learned and best practices for sharing to other projects, and for future projects.

This activity will be conducted by the end of the project in the fifth year.

No	Activity	Project Output	Budget/Implementation Year					Total
			2022	2023	2024	2025	2026	
4.1.1.1	1.1.1.1 Conduct an independent mid-term project review	Mid-term project review completed			39,986			39,986
4.1.2.1	Conduct an independent project terminal evaluation at the end of the project	Project terminal evaluation completed					40,000	40,000
<b>Total</b>								<b>79,986</b>

Table 17: Budget and implementation for Activities 4.1.1.1 and 4.1.2.1

## Theory of Change (TOC)

The project solutions in the ToC are based on the root causes lay under the unsustainable transport problem in Malaysia. The project outputs are structured to target one or more root causes. Different colors and lines denote the different aspects of the project's theory of change (root causes, assumptions, outputs, etc.). Component 4 on monitoring and evaluation, gender mainstreaming and environmental and social impact assessment are considered cross-cutting and not shown in the ToC.

The ToC shows that IF the outputs (project interventions) are conducted successfully THEN the project will reduce GHG emissions resulting from decarbonised electric mobility BECAUSE creating evidence through pilot technology demonstration, building capacity on e-mobility and sustainable battery use and enabling policies and investment conditions for private sector will accelerate the adoption of EVs in Malaysia.

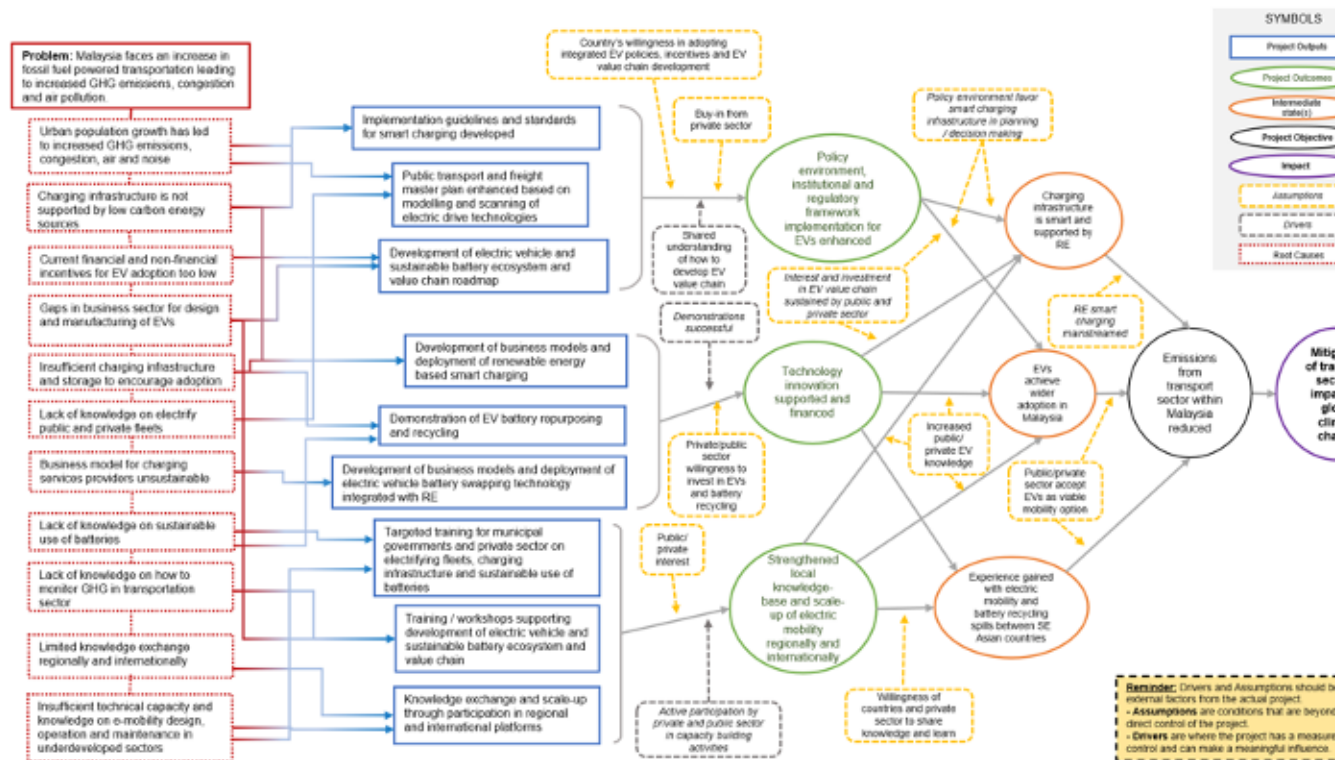


Figure 11: Theory of Change

### d) alignment with GEF focal area and/or Impact Program strategies;

This project is categorized under the GEF-7 Climate Change Mitigation (CCM) focal area, specifically addressing the strategic area of CCM-2: Promote innovation and technology transfer for sustainable energy breakthroughs for electric drive technologies and electric mobility. The project supports decarbonisation of Malaysia's transport sector and industries by promoting the adoption of low-carbon technologies and innovative approaches to market transformation. In particular, the project aligns with GEF's CCM focal area by increasing the competitiveness and productivity of industrial firms and their processes, contributing to direct reductions in GHG emissions and indirect reductions via scale-up within the industry and the market.

**e) incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and co-financing;**

The GEF financing will lead to an unlocking of existing mechanisms in Malaysia to encourage the upscaling of electric vehicle technology and produce global environmental benefits in the form of GHG reductions at a cost of 5.82 USD per tonne (based on direct emission reductions only). The GEF financing will build upon the Low Carbon Mobility Blueprint and allow for the scale up of investment in Malaysia through a triage of approaches:

- ? Policy, standards and regulation adoption that encourage the use of smart charging infrastructure, electrification of public transport and freight, and support the development of a national EV ecosystem and value chain;
- ? Targeted GEF grant supports linked to a large amount of investments in EVs and EV infrastructure ? including technology such as the re-use of EV batteries for grid stabilisation and / or charging infrastructure; and
- ? Capacity building for the scale up of knowledge of EV infrastructure installation & maintenance, EV fleet adoption, and how to monitor the impact of policies and investments.

The GEF financing will be critical in unlocking significant co-financing from private sector actors such as automobile manufacturers and at the same time assisting public sector actors such as municipalities, regional-level authorities, and national-level bodies in planning their investments / evaluating the impact of their investments and policies in the sector.

Components	Business as usual	Incremental cost reasoning	Main outcomes expected
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1. Strengthening the national policy and institutional frameworks into implementation of up-scaling electric mobility adoption and sustainable battery use	<p>Electric vehicle charging infrastructure will place greater demand on grid if EV use grows. Potential for grid flexibility in support of renewable adoption will also be missed.</p> <p>Integration of electric mobility into public transport and freight plans will be unlikely in short to medium term.</p> <p>Automotive sector in Malaysia will struggle in short and medium term to pivot towards electric mobility and be reliant on global supply chain.</p> <p>EV battery waste management will be developed reactively</p>	<p>Implementation guidelines and standards for smart and bi-directional charging developed.</p> <p>Accelerated adoption of electric mobility through amendment of the National Transport Policy.</p> <p>Development of an EV Industry Development Roadmap that includes the sustainable use of batteries.</p>	Policy ecosystem, institutional and regulatory framework implementation for electric mobility enhanced.
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<p>2. Investment and commercialization of electric mobility technologies</p>	<p>National experience and understanding of smart charging technology and consideration in national energy planning will remain stagnant in immediate term.</p> <p>Lack of localized examples of EV battery reuse, recycling and safe disposal will not materialize in short to medium term.</p>	<p>Project will demonstrate application of smart charging.</p> <p>Active promotion and engagement with transportation sector and automotive industry to take up the financing and execution of innovation in electric mobility and sustainable use of batteries.</p>	<p>Benefits and application of smart charging are understood and considered in decision making and planning of energy system.</p> <p>Technology innovation in electric mobility, charging infrastructure, battery swapping and battery recycling is financed, supporting the mainstreaming and adoption and greater support for bottom-up innovation in electric mobility.</p>
<p>3. Capacity building and scale-up</p>	<p>Gaps in knowledge on opportunities for electric mobility and private sector fleet electrification will persist.</p> <p>Deployment of EV installation will depend on local contractor's base that are reliant on international manufactures.</p> <p>Lack of capacity for managing lithium ion battery repurposing and recycling will persist.</p>	<p>Capacity building for municipalities and private sector on electrification of fleets and adoption of electric mobility charging infrastructure supported by renewable energy systems.</p> <p>Capacity building for local development of software, manufacturing of hardware and hardware service and repair.</p> <p>Capacity building to manage repurpose or recycling of lithium ion battery and key components of EV (for end of life).</p>	<p>Capacity development and knowledge exchange on lessons learned scaled-up to national, regional and global networks.</p>

4. Monitoring and evaluation	Lessons from implementation are not captured and project risks not meeting its objectives	Effective monitoring and evaluation of project is completed	Project achieves objectives with lessons learned for improving future projects
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Table 18: Incremental cost reasoning and expected outcomes

Co-financing for Component 2 has been further summarized below in Table 19.

Project Outputs	Sub-Component Project	Activity	GEF Budget (USD)	Co-financing Amount (USD)
2.1.1 Development of business models and deployment of renewable energy based smart charging.	Proof of Value for Electric Vehicle Inter-operability Center (EVIC): Vehicle-to-Infrastructure (V2I) in Cyberjaya	Activity 2.1.1.1 Demonstration of EV smart-charging proof of concept for electric vehicles (for passenger vehicle) linked to renewable energy	200,000	4,950,000* ? Location of the demonstration units at new EV Interoperability Centre

	Renewable Energy Smart Charging Demonstration Project for Iskandar Malaysia Bus Rapid Transit (IRT) in Skudai, Johor	<p>Activity 2.1.1.2 Study on inventory of carbon emissions before and after deployment of e-bus and smart charger, including Solar Smart Charging specification (with possibility for multi-use charging)</p> <p>Activity 2.1.1.3 Installation of Solar Smart Charging demonstration units with three main components: solar PV panels (capacity to be determined by the space), battery storage (the battery to utilize EV second life) and fast chargers (plug in for multi-use other than for the e-buses)</p>	<p>50,000</p> <p>300,000</p>	<p>20,540,000</p> <p>? Location of the demonstration units at new bus depot</p> <p>? At least 20 new electric buses to be introduced</p>
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	Solar Smart Electric Bus Charging Infrastructure and Depot Demonstration for Metro Kuching at Demak Laut Industrial Park, Kuching, Sarawak	<p>Activity 2.1.1.4 Study on Solar Smart Charging specification for Electric Bus</p> <p>Activity 2.1.1.5 Installation of Solar Smart Charging demonstration units with three main components: solar PV panels (capacity to be determined by the space), battery storage (the battery to utilize EV second life) and fast chargers (plug in for multi-use other than for the e-buses)</p>	<p>15,000</p> <p>155,000</p>	<p>6,150,000</p> <p>? Location of the demonstration units at new bus depot</p> <p>? At least 20 new electric buses to be introduced</p>
2.1.2 Demonstration of EV battery repurposing and recycling. At least 1 demonstration of battery remanufacturing to be conducted in Cyberjaya.	Development of EV Battery Repurposing and Recycling Value-Chain and Demonstration Project on Remanufacturing of EV Battery	<p>Activity 2.1.2.1 Develop Standards and Guideline for EV Battery Recycling and Repurposing in Malaysia</p> <p>Activity 2.1.2.2 Deployment of Technology Solutions</p> <p>Activity 2.1.2.3 Deployment of prototypes for EV battery second life applications</p>	<p>50,000</p> <p>75,000</p> <p>75,000</p>	<p>*subsumed under MARii's co-financing</p> <p>? Location of the demonstration project</p>



reductions of each subsequent investment are summed over their respective lifetimes for a cumulative measurement.

Towards accelerating the adoption and scale-up of climate-smart transport in Malaysia with clear LCMB targets of achieving 15% Total Industry Volume (TIV) of electric car, 15% TIV of electric motorcycle and 10,000 EV charging by 2030, this project will provide technical assistance and facilitate investment mobilization for pilot demonstrations in the central, southern and east Malaysia.

The project will contribute to the mitigation of greenhouse gases in the Malaysian transport sector. The project will result in direct emission reductions of an estimated 120,002 tCO<sub>2</sub> (as a result of technology demonstrations, GEF-funded and co-financed activities, and log frame activities) and secondary direct emissions reduction of 10,206,752 tCO<sub>2</sub> (as a result of larger changes in mobility due to the combined effect of factors such as policy changes and behavioral changes occurring during the project period), for total direct emission reductions 10,332,478 tCO<sub>2</sub>, at a cost per tonne reduction of 5.82 USD (based on total direct emissions only). Indirect emissions reductions are the result of larger changes in mobility due to the combined effect of factors such as policy changes, industry development, capacity building and behavioural changes occurring during the project period. These have been estimated at 19,650,532 million tonnes. This also based on assumed installation of 4.1 MW of new PV capacity under the project.

An additional 5,724 tCO<sub>2</sub> in direct GHGs mitigated could be realized in addition to this total if co-financing for investment in 6 electric train cars is realized following completion of activities under Output 1.1.2.

The breakdown of total (direct + indirect) GHG emission mitigation of 34,217,576 tCO<sub>2</sub>eq is summarized here briefly. The indirect post-project mitigation of this total corresponds to 19,650,532 tCO<sub>2</sub>eq, assumed to be realized through replication in Malaysia.

See below the summary table of the GHG mitigation potential.

Total top-down emission mitigation potential, tCO <sub>2</sub> , thereof	
Total direct emissions mitigation 2022 - 2037, tCO <sub>2</sub>	10,332,478
Direct emission mitigation from demonstration 2022 - 2026, tCO <sub>2</sub>	120,002
Secondary direct emission mitigation 2022 - 2037, tCO <sub>2</sub>	10,206,752
Indirect emission mitigation 2022 -2037, tCO <sub>2</sub>	19,650,532
<b>Total project related emissions reductions, tCO<sub>2</sub></b>	<b>34,217,576</b>
Total GEF investment, USD	1,776,484
GEF efficiency USD/ Total direct emissions mitigation 2022 - 2037, tCO <sub>2</sub>	5.82
GEF efficiency USD/ Total project related emissions reductions, tCO <sub>2</sub>	19.26

Table 20: Summary of project GHG emissions mitigation potential

Please see below a graph comparing low-carbon e-mobility scenario to business-as-usual scenario.

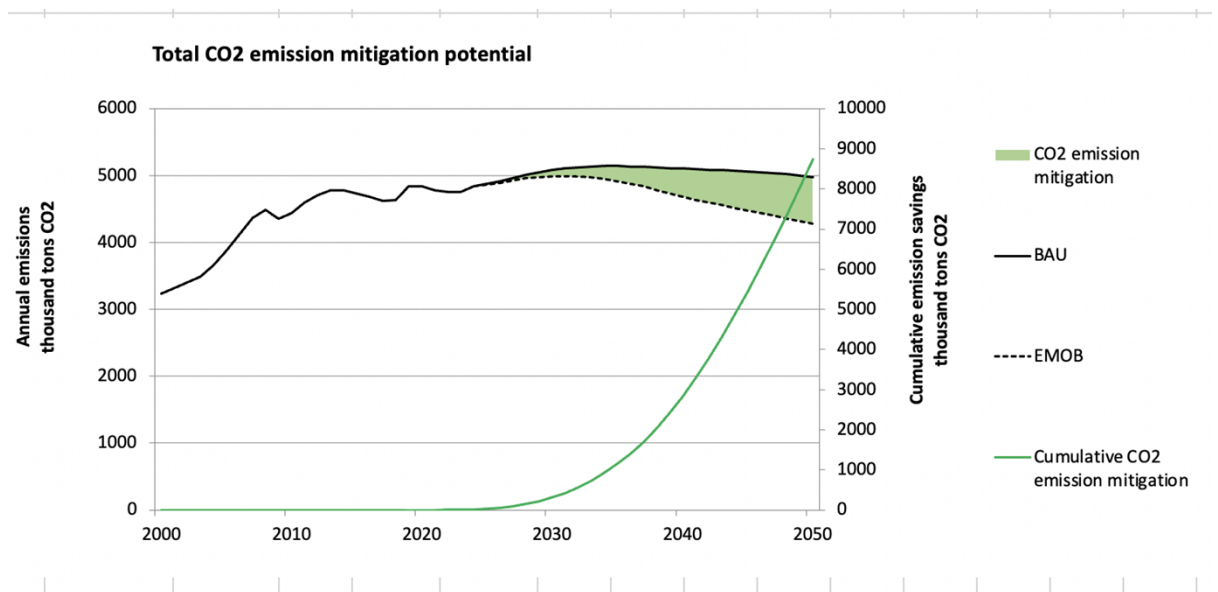


Figure 12: Low-carbon e-mobility scenario to business-as-usual scenario - Electric Buses

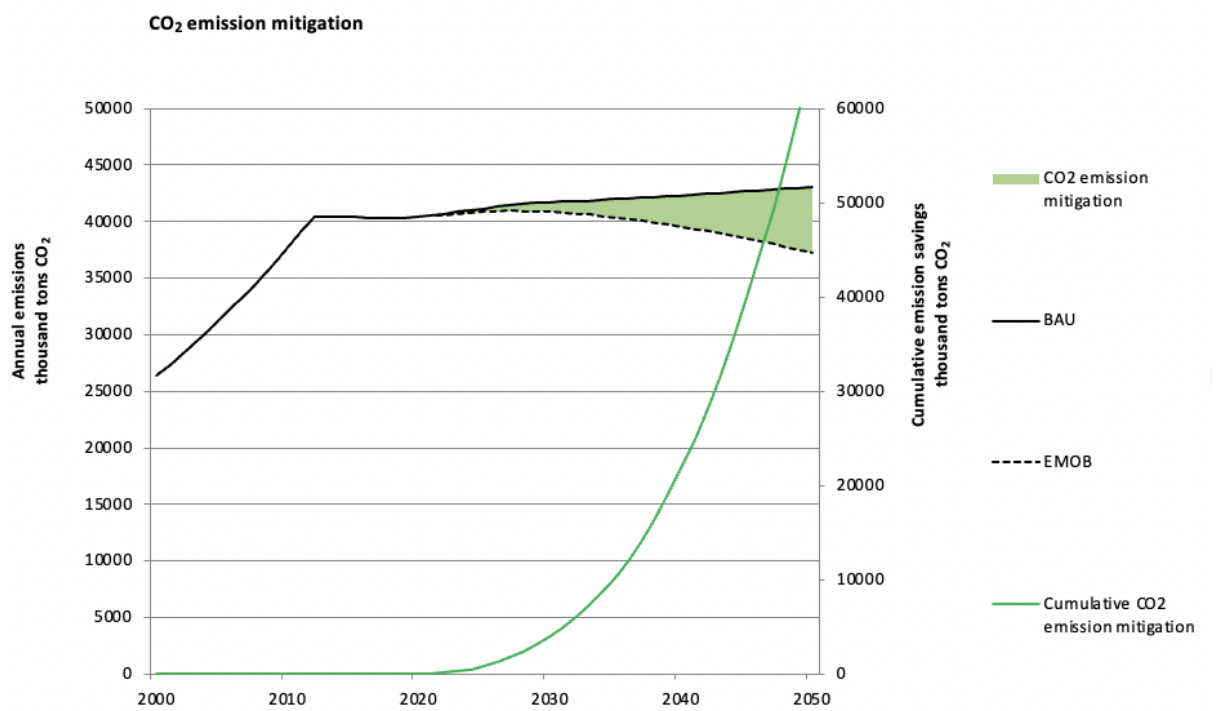


Figure 13: Low-carbon e-mobility scenario to business-as-usual scenario - Electric Motorcycles

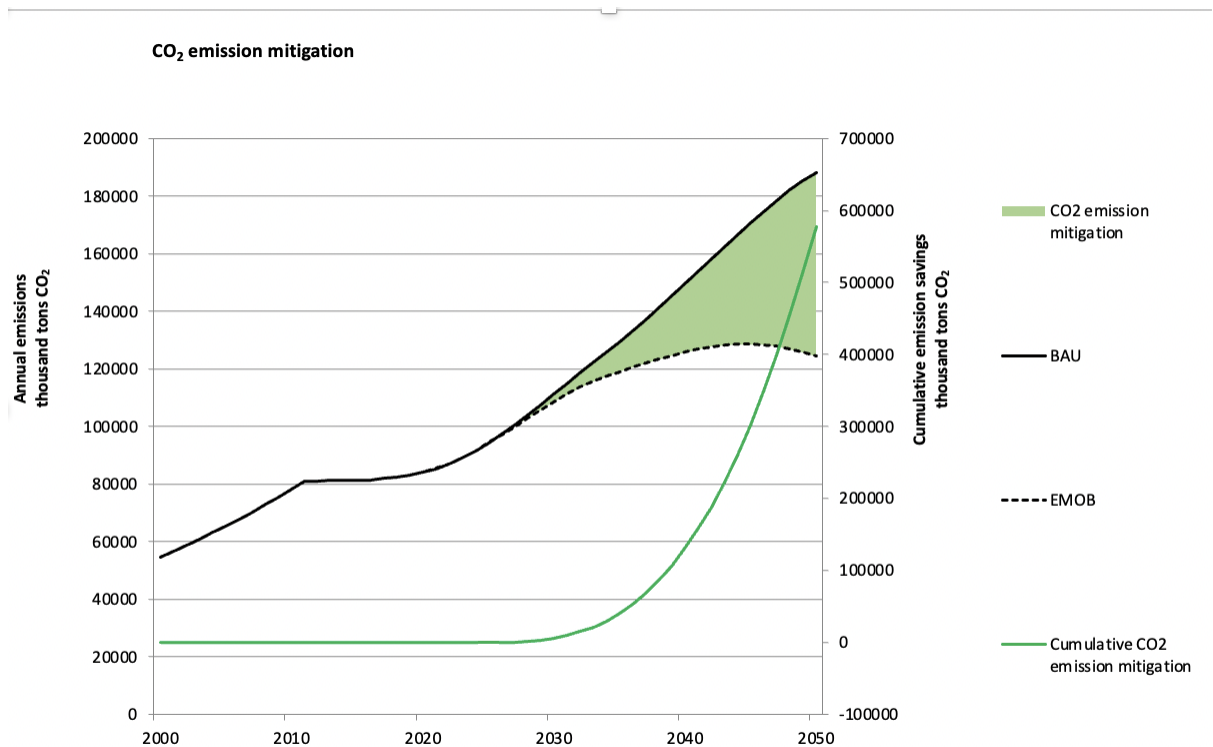


Figure 14: Low-carbon e-mobility scenario to business-as-usual scenario ? Electric Passenger Cars

The increased use of low-carbon transportation and infrastructure will directly serve 8,000 passengers daily, of which 50% are assumed to be women. Other direct beneficiaries are expected in the private and public sector as recipients of trainings and knowledge exchange through connecting with regional and global platforms. Assuming that 0.003% of the 2.5 million public of the targeted cities will be permanent users and that buses will also be used for interregional travel, the project will indirectly benefit 40,000 people. The project will impact a wide scope of inhabitants due to cleaner air.

More details can be found in the GHG mitigation emission annex.

The assumption and sources of the input data used for the calculations are summarized below.

The vehicle stock numbers in Malaysia are taken from national data and estimations. The economy growth rate indicator is also used for secondary direct and indirect GHG emission calculations. The growth rate (%) of Malaysia economy is expected to bounce back to the pre-COVID period, therefore, this value is estimated to average 6% from 2023 to 2030 and slowdown to stay 2% from 2031 to 2050 based on World Bank data. The value for electricity well-to-tank emissions (grid emission factor, kgCO<sub>2</sub>/kWh) is taken from the Institute for Global Environmental Strategies (IGES), population data is gathered from the statistics of UN Population division and GDP prospects from IFC. It is also considered that the grid emission factor of Malaysia is assumed to be reduced moderately starting from 2025 in line with national policies and INDC and trends such as climate agenda, green recovery and capital investment costs for renewable energy technologies.

The estimation of number of beneficiaries is 10,000 beneficiaries. The total number consists of the following:

- ? Number of trainees in all technical and institutional workshops and training sessions: 1,000 (50% women)
- ? Number of municipal population (3,000) and regional riders (5,000) that will use EVs as passenger/drivers etc. (50% women)
- ? 200 direct and 800 indirect jobs created and employment in new business: 1,000 people (50% women)

Therefore, the total number of beneficiaries has been calculated as such:  $1,000 + 8,000 + 1,000 = 10,000$ ; 5,000 being females and 5,000 males.

#### **g) innovation, sustainability and potential for scaling up.**

##### **Innovation**

This project is ambitious in its intent to provide necessary technical assistance in support of delivering needed interventions for electric vehicles outlined in Malaysia's Low Carbon Mobility Blueprint (LCMB) while supporting three additional innovations. (1) The demonstration and adoption of smart charging infrastructure in support of increasing the penetration of renewables into Malaysia's grid and further decarbonisation of Malaysia's transportation sector. This intervention acknowledge and further prepares Malaysia for the larger trend of convergence between the energy and transportation sector; (2) The project supports national innovation within the automotive sector by supporting the development of a national EV Industry Roadmap, and improving capacity and knowledge for innovation along the EV value chain within Malaysia; and (3) The project supports the development of necessary capacity for lithium ion battery repurposing and recycling ? a gap that is critical to the long-term sustainability of EV adoption in the country.

The output of this project would directly contribute towards Malaysia's agenda on developing local capacity and capability in strategic technologies of EV and EV components. As described in earlier sections, MOSTI and NanoMalaysia is championing EV battery and energy storage systems while many research institutions and private sectors are also venturing into these technological based solutions. The technical assistance for the demonstration projects allows platforms for practical on the ground application of such technologies, where possible, by leveraging upon the sites such as in Cyberjaya, Iskandar Malaysia and IRDA. The project will seek further cooperation from other key stakeholders, for instance MOSTI's agencies and R,D&I grants from MOSTI will be leveraged for bigger impact.

##### **Sustainability**

The project has high-level buy-in from relevant government ministries and agencies and their consistent engagement throughout the project is a key to ensuring the sustainability of the project's interventions. A high level of ownership over the outcome of the project will be facilitated by ensuring it continues to respond to the present and emerging needs of the Government and by actively engaging stakeholders throughout project planning and implementation. In particular, MGTC will play a significant role in executing the project, building capacity and knowledge in sustainable transport that will ensure continued implementation of the Low Carbon Mobility Blueprint following the conclusion of the project.

MGTC as the lead agency of KASA mandated to drive the country in the scope of Green Growth, Climate Change Mitigation and Green Lifestyle, will carry through the output of the project towards national adoption in term of policies, standards and guidelines, and replication in other cities for output under demonstration projects. Through the close collaboration between public and private sectors for all demonstration projects identified, riding on existing ecosystem developed from previous GEF projects, will ensure sustainability of the projects. In addition, new partners connected through this project during the PPG phase presents a promising future collaborative efforts.

The reporting of the activities after the project has ended, will continue through LCMB and EV Roadmap that continuously collects information on EV-related initiatives throughout Malaysia and reports directly to Malaysia Climate Change Action Council (MyCAC). The results of the projects will be made accessible for all stakeholders across all Ministries, agencies, industries and society in moving the EV agenda forward.

Under Component 3 on capacity building and scale-up, training of trainers will also be undertaken to develop a pool of competent pool of instructors who will be able to conduct knowledge sharing with other people in the future. This will enable sustainability through knowledge management (please see section on knowledge management for further elaboration).

### **Potential for scale-up**

The primary function of this project support initiatives outlined under the LCMB that would support that national scale-up of electric mobility within the country. Specifically, the project targets interventions that support the LCMB's electric mobility focal area by ensuring multi-stakeholder engagement, facilitating partnerships with the private sector, capacity building that targets key public and private actors and infrastructure. The GEFTF grant will also fund key initiatives required to facilitate additional co-financing from the government for scale-up across the country. Co-benefits in terms of scale-up will also be realized with MGTC as an executing partner, with the knowledge and experience gained under this project crossing over into other initiatives outside the scope of this project, but also contributing to climate action within the country and in turn, global environmental benefits.

The scaling up prospect is huge considering positive response from many partners obtained during PPG. Significant opportunities for expansion in other geographical regions beyond the project's scope are also supported by the increasing interest in EV following the Government's announcement on EV incentives for 2022, Malaysia's climate ambitions highlighted during COP26, states leadership in championing low carbon mobility agenda as well as private sectors' pledge to shift towards cleaner energy production and consumption. The demonstration projects will lead the way for greater scale-up and set the benchmark and best practices for other cities to follow suit. Partnership in demonstration projects for Iskandar Bus Rapid Transit and Kuching Metro City Bus is strategic considering wide visibility for both sites, especially with Iskandar's being the first location in Malaysia to introduce full scale Bus Rapid Transit system and Sarawak is the leading state to introduce the first electric bus depot in Borneo. The media coverage will not only provide visibility locally but will also be showcased internationally. Meanwhile, the demonstration site in Cyberjaya will gain future attention as EVIC will be the first full scale testing

centre for EV in the country. The scale-up in other localities will also be guided by the policy, standards and guidelines to be developed as output under Component 1.

Multiple national platforms on EV-related areas hosted by other Ministries, agencies and private sector have been identified. These platforms will be used to garner more support and create linkages for scale-up.

Additional opportunity for scale-up regionally will be facilitated through connecting this project with international platforms, facilitating knowledge sharing of best practices and lessons learned. This includes connecting the project with the UNEP/IEA led GEF 7 Global Programme to Support Countries with the Shift to Electric Mobility. Regional connections would be further through the regional Support and Investment platforms managed by the Asian Development Bank.

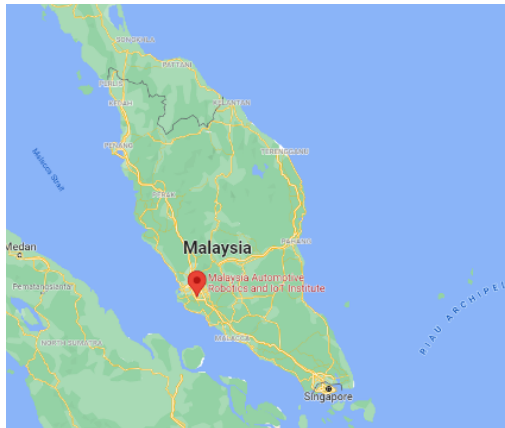
#### **1b. Project Map and Coordinates**

**Please provide geo-referenced information and map where the project interventions will take place.**

##### **Demonstration Cities**

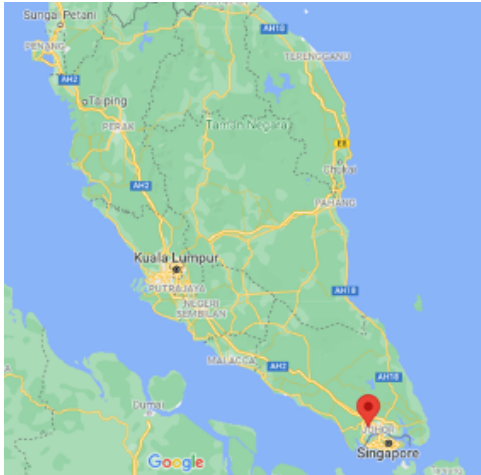
Based on the stakeholder discussions, strong interest and high potential for replication, three demonstration cities have been chosen at Cyberjaya, Iskandar Malaysia and Kuching. These locations offer unique potential for raising awareness, increase knowledge and multiple stakeholder involvement in the respective places.

##### **Proof of Value for Electric Vehicle Inter-operability Center (EVIC): Vehicle-to-Infrastructure (V2I) in Cyberjaya**



Geographical Location for Proof of Value for Electric Vehicle Inter-operability Center (EVIC):  
Vehicle-to-Infrastructure (V2I) in Cyberjaya  
(Coordinates: 2.903136, 101.651169)

##### **Renewable Energy Smart Charging Demonstration Project for Iskandar Malaysia Bus Rapid Transit (IRT) in Skudai, Johor**



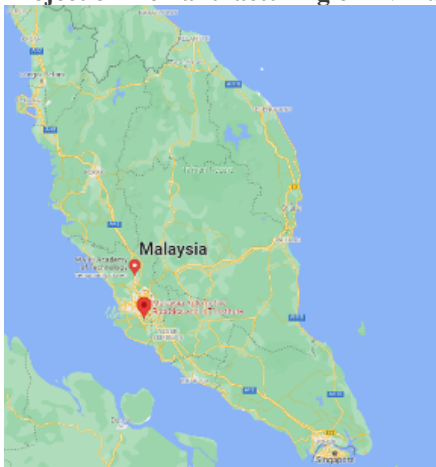
Geographical Location for Renewable Energy Smart Charging Demonstration Project for Iskandar Malaysia Bus Rapid Transit (IRT) in Skudai, Johor  
(Coordinates: 1.5633722817996432, 103.65550075719715)

### **Solar Smart Electric Bus Charging Infrastructure and Depot Demonstration for Metro Kuching at Demak Laut Industrial Park, Kuching, Sarawak**



Geographical Location for Renewable Energy Smart Charging Demonstration Project for Kuching Metro at Demak Laut Industrial Park in Kuching, Sarawak  
(Coordinates: 1.5928386316765086, 110.40893616062701)

### **Development of EV Battery Repurposing and Recycling Value-Chain and Demonstration Project on Remanufacturing of EV Battery**



Geographical Location for Remanufacturing of EV Battery Demonstration Project in Cyberjaya  
(Coordinates: 1.5633722817996432, 103.65550075719715)

**1c. Child Project?**

**If this is a child project under a program, describe how the components contribute to the overall program impact.**

n/a

## **2. Stakeholders**

**Select the stakeholders that have participated in consultations during the project identification phase:**

**Civil Society Organizations** Yes

**Indigenous Peoples and Local Communities**

**Private Sector Entities** Yes

**If none of the above, please explain why:**

n/a

**Please provide the Stakeholder Engagement Plan or equivalent assessment.**

UNIDO is the GEF implementing agency of the project and is accountable for the GEF Grant. The Executing Agency is Malaysian Green Technology and Climate Change Centre (MGTC). As the executing agency, MGTC will also coordinate the execution of project delivery partners and experts through their procurement and recruitment processes.

The Ministry of Environment and Water (KASA) is the primary government counterpart for the project and will act as the primary the chair of the Project Steering Committee. Other key ministries are the Ministry of Transport (MOT), the Ministry of International Trade and Industry (MITI), Ministry of Finance (MOF) and the Ministry of Energy and Natural Resources (KeTSA)? which will be key counterparts on different components of the project and members of the project?s steering committee.

Stakeholders will form a comprehensive integrated structure to enhance a synergy among the project partners and serve as the knowledge source of new clean technologies, emerging entrepreneurs, knowledge network, applied research collaboration and additional team members. Furthermore, to promote gender quality and the empowerment of women the guiding principle will be to ensure equal opportunity for women and men to lead, participate in and benefit from the project, e.g. early involvement of women entrepreneurs, associations that promote GEEW and gender focal points. This will be in line with the GEF Policy on Stakeholder Engagement that sets out the core principles and mandatory requirements for stakeholder?s involvement.

	Stakeholder	Role in the project
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Implementation Agency	United Nations Industrial Development Organization (UNIDO)	<p>UNIDO is the specialized agency of the United Nations that promotes industrial development for poverty reduction, inclusive globalization and environmental sustainability.</p> <p><b>Role in the project</b> UNIDO will act as the Implementation Agency for the project and take a lead role in managing Component 4: Monitoring and Evaluation. This includes coordinating the Independent Midterm and Final Evaluations.</p>
Executing Agency	Malaysian Green Technology and Climate Change Centre (MGTC)	<p>The Malaysian Green Technology and Climate Change Centre (MGTC) is an entity under the Ministry of Environment and Water (KASA) and tasked on strategizing climate actions and promoting uptake of green technology innovations across industries</p> <p><b>Role in the project</b> MGTC will act as the project's executing agency. As the executing agency, MGTC will also coordinate the execution of project delivery partners and experts through their procurement and recruitment processes.</p>
Steering committee member	Ministry of Environment and Water (KASA)	<p>The Ministry of Environment and Water (KASA) is responsible for water management and sustainable environment</p> <p><b>Role in the project</b> KASA will provide oversight to the project through their role in the Project Steering Committee.</p>
Steering committee member	Ministry of Energy and Resources (KeTSA)	<p>Ministry of Energy and Natural Resources is the ministry that looks into strengthening sustainable energy initiatives and conservation of natural resources among others.</p> <p><b>Role in the project</b> For this project, KeTSA will also work alongside with project team and KASA for policy adoption (Component 1)</p>
Steering committee member	Ministry of Transport (MOT)	<p>The Ministry of Transport is the ministry in Malaysia responsible for all aspects of transport in the country: road transport, road safety, logistics, shipping, railway assets, rail transport, civil aviation, maritime safety and so forth. In this regard, the MOT is tasked with formulate and implementing policies and plans in these areas as well as facilitate and implementing regional and international cooperation on transport matters.</p> <p><b>Role in the project</b> For this project, the Ministry of Transport will be the primary counterpart for policy adoption (Component 1), and monitoring, reporting and verification protocols (Component 3).</p>

Steering committee member	Ministry of Finance (MOF)	<p>The Ministry of Finance is charged with the responsibility for government expenditure and revenue raising. The ministry's role is to develop economic policy and prepare the Malaysian federal budget. The Ministry of Finance also oversees financial legislation and regulation</p> <p><b>Role in the project</b> For this project, the MOF will be the primary counterpart on all matters related to government expenses.</p>
Steering committee member	Ministry of International Trade and Industry (MITI)	<p>The Ministry of International Trade and Industry (MITI) is responsible for formulating and implementing investment, trade and industrial policies to generate sustainable economic growth as well as create innovative and high skilled employment opportunities for Malaysia's growing workforce.</p> <p><b>Role in the project</b> The project will work with MITI on coordinating project components to support EV Industry Development.</p>
Project partner	Road Transport Department of Malaysia (JPJ)	<p>The JPJ is under the MOT and is responsible for the registration and licensing of drivers and all motor vehicles and trailers in Malaysia. As per the Road Transport Act, enforcement and regulatory responsibilities are under the JPJ's purview.</p> <p><b>Role in the project</b> For this project, the JPJ is a key counterpart for the training module and assessment (under Component 3) and other policies as appropriate.</p>
Project partner	Land Public Transport Agency (APAD)	<p>The Land Public Transport Agency (APAD) is an agency under the Ministry of Transport Malaysia responsible for planning and defining land-based public transport policies, programs and strategies to enhance the country's public transportation system, which is the core of the National Key Result Area (NKRA). This includes determining policies and planning rail, bus and taxi services and transporting goods through rails and roads.</p> <p><b>Role in the project</b> For this project, APAD is the main counterpart on policies and plans (such as support for modal switching to electric public transport under Component 1).</p>
Project partner	Malaysia Automotive, Robotics and IoT Institute (MARii)	<p>Malaysia Automotive, Robotics &amp; IoT Institute (MARii) is an agency under the Ministry of International Trade and Industry (MITI). Serving as the focal point, coordination centre and think tank for the nation's automotive industry, it functions to enhance technology, human capital, supply chain, market outreach and aftersales capabilities of all automotive stakeholders and ecosystems.</p> <p><b>Role in the project</b> For this project, MARii is a key counterpart for development and implementation of vehicle labeling programme (Component 1 and arrange relevant stakeholders consultation workshops). Opportunities for development of an EV Interoperability Centre will be explored during PPG.</p>

Project Partner	Iskandar Regional Development Authority (IRDA)	<p>Iskandar Regional Development Authority (IRDA) is a Malaysian Federal Government statutory body tasked with the objective of regulating and driving various stakeholders in both public and private sector towards realizing the vision of developing Iskandar Malaysia into a strong and sustainable metropolis of international standing.</p> <p><b>Role in the project</b> IRDA will be the key project delivery partner for demonstration project in the Southern region of Peninsular Malaysia.</p>
Project partner	Private sector	<p>The private sector partners will include automobile manufacturers like Perusahaan Otomobil Nasional (Proton) and electric bus operators such as Henz Pacific Sdn Bhd.</p> <p><b>Role in the project</b> These partners will participate by providing co-financing in the form of equity, including offering electric vehicles and sites for demonstration of new technologies such as smart charging systems (Component 2).</p>
Project partner	Civil Society Organizations (CSOs)	<p>CSOs are essential stakeholders to the project design, implementation and long-term sustainability. Some relevant organizations envisioned to be engaged with the project include the EV Owner Association of Malaysia, the EV Association of Malaysia and the Centre for Environment, Technology and Development, Malaysia (CETDEM).</p> <p><b>Role in the project</b> CSOs will be engaged with providing inputs to policy enhancement recommendations under Component 1 as well as beneficiaries of capacity building and knowledge exchange under Component 3. CSOs will also participate in the design and development of demonstrations planned under Component 2 to ensure local needs are met and to instill a sense of ownership necessary for the project's sustainability and scale-up.</p>
Project partner	Academia	<p>The involvement of academic institutions within Malaysia is critical to the success of the project and long-term sustainability of its outcomes. Expertise and capabilities have been identified within national universities that would be relevant to this project.</p> <p><b>Role in the project</b> Project will partner with universities to inform policy enhancement under Component 1, technology demonstration under Component 2, and capacity building under component 3. This will include involving academics as technical panel experts as well as facilitate collaboration between academia and the private sector to commercialize technologies that already have proof of concepts.</p>

Project partner	National financial institutions	<p>Financial institutions engagement is critical to supporting the upscaling of the project activities and long-term adoption of electric mobility in the country. Institutions already engaged in green finance will play a role in extending support to EV adoption.</p> <p><b>Role in Project</b> Financial intermediaries and institutions will be engaged under Component 1 and 2 through the ?Green Technology Financing Scheme? which provides a guarantee mechanism to banks and an interest rate subsidy for green technology development ? though to date it has mostly been used for solar PV project development. This is run by the Ministry of Finance in cooperation with the Government-owned organization MGTC ? and is linked with various Malaysian banks.</p>
Project partner	Gender focal points and associations that promote GEEW	<p>UNIDO?s mandate to promote inclusive and sustainable industrial development (ISID) relies on the advancement of gender equality and the empowerment of women. UNIDO addresses gender inequalities in industry and harnesses women?s full potential as economic agents of change and leaders thereby transforming economies and generating inclusive growth. One of the guiding principles of the project will be to ensure that both women and men are provided equal opportunities to lead, participate in, and benefit from the project (UNIDO Gender Policy 2019). The project has been developed considering the UNIDO guide on gender mainstreaming in energy and climate change projects.</p> <p><b>Role in the project</b> Gender dimensions will be considered in all decision-making processes. With respect to project management, the Project Steering Committee meetings will aim to be gender balanced and extend invitations to observers that represent gender dimensions, such as organizations / associations promoting gender equality and advocating women?s empowerment. During project activity implementation, effort will be given during stakeholder consultations towards focusing on gender equality and women?s empowerment issues, in particular during policy review and formulation.</p>

Table 21: Stakeholders and role in project

The project's stakeholder approach is expanded further on in the attached Stakeholder Engagement Plan.

In addition, provide a summary on how stakeholders will be consulted in project execution, the means and timing of engagement, how information will be disseminated, and an explanation of any resource requirements throughout the project/program cycle to ensure proper and meaningful stakeholder engagement

Stakeholder group	Purpose of engagement	Means of engagement	Responsibility	Frequency
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Stakeholders to be affected directly by the results of project implementation	PSC members	To effectively and efficiently perform their roles as PSC members.	Project website, training, webinars, capacity building and policy workshops, policy support, links with other e-mobility projects, project reports and flyers	MGTC	Continuous
	Entrepreneurs / SMEs / Private sector	To be encouraged to participate in project including training and capacity building and provide feedback.	Project website, training, consultations webinars, workshops, networking, project reports and flyers, e-newsletter	MGTC	Continuous
	Demonstrations sites	To be encouraged to participate in project including training and capacity building and provide feedback.	Project website, training, consultations webinars, workshops, networking, project reports and flyers, e-newsletter	MGTC	Continuous
	Public transport providers	To be encouraged to participate in project including training and capacity building and provide feedback.	Project website, training, consultations webinars, workshops, networking, project reports and flyers, e-newsletter	MGTC	Continuous
Stakeholders to be affected indirectly by the results of the project implementation	Business associations:	To provide feedback, advice and support outreach activities	Project website, stakeholder consultation workshops, e-	MGTC	Continuous

	Civil society	To provide feedback on the design and project results among members, including environmental and socio-economic impacts and effectiveness of mitigation measures	newsletters, meetings, reporting	MGTC	Continuous
Stakeholders involved in the project's management	MGTC UNIDO	To provide feedback on project implementation (including suggestions for improvement)	Meetings, trainings, emails, phone calls, exchange of minutes, memos and official letters, project website; Two-way interaction between GEF-UNEP global programme and project on the development of guidebooks and guidelines	MGTC/UNIDO	Continuous

Table 22: Stakeholder Engagement Plan

**Select what role civil society will play in the project:**

**Consulted only;** Yes

**Member of Advisory Body; Contractor;** Yes

**Co-financier;**

**Member of project steering committee or equivalent decision-making body;** Yes

**Executor or co-executor;**

**Other (Please explain)**

n/a

### **3. Gender Equality and Women's Empowerment**

#### **Provide the gender analysis or equivalent socio-economic assesment.**

UNIDO recognizes that gender equality and the empowerment of women have a significant positive impact on sustained economic growth and inclusive development of sustainable transport, key drivers of poverty alleviation and social progress. The UNIDO vision, as laid down in the 2019 Policy on Gender Equality and the Empowerment of Women (DGB/2019/16), is that women and men can equally lead, participate in, and benefit from inclusive and sustainable industrial development. Towards this vision, UNIDO follows a comprehensive approach to gender equality and the empowerment of women, recognizing the interests, needs and priorities of both women and men and the intersecting diversity of different groups. Moreover, UNIDO recognized the importance of involving vulnerable groups (incl. women of colour, young women) and the economy and society at large (with a special focus on groups most affected by climate-prone natural disasters).

A social and gender analysis was conducted during the PPG phase (see attached Gender Analysis and Gender Mainstreaming Plan). To establish a gender baseline and develop gender-based targets, basic data and qualitative information on social and gender aspects of the project was collected during PPG phase and PPG funds were allocated towards a review of the project design by a gender expert.

Research has demonstrated that women and men have different mobility needs and priorities. Moreover, women users of public transport tend to be more susceptible to negative impacts of inadequate mobility choices as well as low public transport service levels.

As a guiding principle, the project is designed to ensure that both women and men (including as staff in institutions, as experts, and as audience, speakers and panelists at events, or where relevant in communities benefiting from the e-mobility pilots) are provided equal opportunities to lead, participate in and benefit from the project.

In practical terms, this will be demonstrated in a multitude of ways:

? A Gender baseline report as well as a draft gender mainstreaming strategy and action plan has been prepared for this project during the project preparation grant phase.

? Based on the General-Neutral ToRs, gender sensitive recruitment will be practiced at all levels where possible, especially in the selection of project staff, researchers and experts, as well as technical staff. Gender sensitive recruitment will be encouraged in instances where the project does not have direct influence.

? Existing staff will be trained and their awareness raised on gender issues when possible.

? Gender dimensions will be considered when data collections or assessments are conducted as part of project implementation. Examples include sex-disaggregated data collection and a gender analysis being completed during the PPG phase.

? Gender dimensions will be considered in all decision-making processes. With respect to project management, the Project Steering Committee meetings will aim to be gender balanced and extend invitations to observers that represent gender dimensions, such as organizations / associations promoting gender equality and advocating women's empowerment. During project activity implementation, effort will be given during stakeholder consultations towards focusing on gender equality and women's empowerment issues, in particular during policy review and formulation.

? Efforts will be made to promote participation of women in training activities, both at managerial and technical levels, as participants and trainers. This can include advertising of the events to women's technical associations, encouraging companies to send female employees, provide childcare and safe transport, offer scholarships or reduced fees for women, adjusting TOR for selection of the trainers, etc.

- ? The project will pursue thorough gender responsive communication and ensure stakeholder involvement at all levels, with special regard to involving women and men, as well as civil society and non-governmental organizations promoting gender equality. This shall mitigate social and gender related risks, promote gender equality, create a culture of mutual acceptance, and maximize the potential contribution of the project to improving gender equality in the energy field.

The planned project outcomes will be enhanced by considering gender equality and women's empowerment by adopting a gender lens at high-level decision-making bodies and forums, and within planning and developments relating to sustainable transport. A component-by-component short description is provided:

**Component 1:** The consultations for the strategy and the policy have women consultations targets. Women's organizations will also be invited to the validation workshops. The policy and strategy will be gender-sensitive. Women's socio-economic conditions are taken into account in the strategy. At least one PMU member is assigned as the Gender Focal Point to ensure that the relevant project interventions are gender responsive. Meetings and workshops under this component have women participation targets.

**Component 2:** The focus of this component is the successful implementation of a demonstration-scale pilot project for e-mobility. The project will consult with the women associations and local community during the design of the pilot projects to not only integrate the needs of women and youth into project design but also provide equal opportunities for women and men to lead, benefit from and participate in the demonstration-scale pilot project.

**Component 3:** The training activities under this component have women participation targets and women's training needs are taken into account following consultations with local women's organizations. During the PPG phase the gender context and relevance of the proposed project has been assessed in order to ensure the final project design fully considers its implications for women and men. This involved identification of the differentiated needs and roles of women and men as

they relate to the project's interventions. Gender responsive training material will also be developed.

Additionally, the PPG stage has been used to create relevant tools and methodologies for tracking gender issues throughout the project's implementation. To establish a baseline and develop targets, basic relevant data and qualitative information was collected during PPG and gender markers have been assigned at the output level in the project design. Budget will also be dedicated, as needed, during project implementation to identify and address gender issues, including collecting additional baseline data and monitoring progress towards the targets

**Does the project expect to include any gender-responsive measures to address gender gaps or promote gender equality and women empowerment?**

Yes

**Closing gender gaps in access to and control over natural resources;**

**Improving women's participation and decision making** Yes

**Generating socio-economic benefits or services or women**

**Does the project's results framework or logical framework include gender-sensitive indicators?**

Yes

#### **4. Private sector engagement**

**Elaborate on the private sector's engagement in the project, if any.**

A key partner and beneficiary of the project is the private sector, especially the automotive sector and technology solutions providers. For this reason, the private sector (i.e., Proton, Henz Pacific Sdn Bhd and Yinson Holdings Berhad) has been engaged in this proposal's development and will be continue to be involved through the design, implementation and execution of the project. The private sector will also provide co-financing for GEF funded activities in term of site locations for demonstrations on smart charging and battery swapping technology.

As outlined in Component 1 and 3, the project aims to develop an EV Industry Development Roadmap as well as provide training to public and private sector actors engaged in electric mobility to support creating an ecosystem within Malaysia for innovation in this market. In this way, the project will directly support the private sector to develop a value chain for electric mobility and sustainable batteries within Malaysia. The project also aims to support the private sector in the adoption of innovative new technologies and best practices within the industry through technology demonstrations under Component 2. Here, the GEF grant is also helping to mobilize private investment in areas such as smart charging supported by renewable energy as well as the repurposing and recycling of batteries.

Significant effort will be allocated in terms of developing the value-chain for some of these components. For electric motorcycle, there is recognition by key stakeholder of the potential for a

leasing program. There is also interested in exploring the potential for electric motorcycle battery swapping system that will further increase the practicality of the e-motorcycle and ability to reduce the selling price via exclusion of the traction battery in the vehicles? pricing.

Private sector involvement will also be sought for leasing programs for electric bus to bus operators and municipalities, electric car leasing for fleet and ride hailing. The project will also seek for potential direct investment opportunity for both local and foreign on moving up the adoption via the leasing program.

Financial intermediaries and institutions will also be engaged through the "Green Technology Financing Scheme" which provides a guarantee mechanism to banks and an interest rate subsidy for green technology development " though to date it has mostly been used for solar PV project development. This is run by the Ministry of Finance (MOF) in cooperation with the Government-owned organization MGTC " and is linked with various Malaysian banks.

## 5. Risks to Achieving Project Objectives

**Elaborate on indicated risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, the proposed measures that address these risks at the time of project implementation.(table format acceptable):**

Risks	Risk Level	Risk description	Mitigation Measures
Political and institutional risk	Low	This risk entails lack of sufficient support and engagement from the relevant ministries and institutions.	<p>Component 1 and Component 2 of the project includes extensive engagement with the relevant institutions at national, city and local levels. The risk of leadership changes during the course of the project is a possibility against which the project cannot hold influence.</p> <p>Under Components 2 and 3, the project focuses significantly on private-sector engagement which would be less affected by leadership change For this reason, overall project risk is low, although political/institutional risk for Component 1 could be higher.</p> <p>The capacities of government and local authorities will be increased through trainings and workshops to implement policies and programs on electric mobility and sustainable battery use. The content of these workshops will include social and environmental aspects.</p>

Operational risk	Medium	Delays in the proposed improvements to institutional and regulatory framework by public institutions.	<p>This risk is considered medium since the scale-up of infrastructure and electric mobility investments, (e.g., Components 2 and 3) depend on a clear policy and regulatory framework that can take significant time to develop and implement due to national approval processes.</p> <p>The risk will be mitigated by identifying and engaging external consultants through the project to develop draft policies which can be quickly adopted by the government. Multiple experts have been identified in the pre-project design phase who have demonstrated expertise in transportation strategy and technical issues. It is expected that these experts will be engaged under Component 1 in order to help advance discussions on policy.</p>
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<p>Climate change risks - Infrastructure developed is vulnerable to climate risks.</p>	<p>Low</p>	<p>Malaysia is located in the southeastern part of the Asian region, consisting of Malaysian Borneo and Malaysian Peninsula. The country has a tropical climate with a daily mean temperature that is fairly consistent year-round. Malaysia's geographical location as well as its low poverty rates mean its vulnerability and risk to natural hazards are relatively lower compared with neighbouring countries, although the country still grapples with high average annual losses – estimated at \$1.3 billion USD by UNISDR (2014). Malaysia grapples with natural hazards such as drought, earthquakes, storm surges and landslides, but the majority of the country's losses are due to flooding (World Bank Climate Change Knowledge Portal). Malaysia's climate also leaves it vulnerable to vector-borne diseases, including dengue fever in urban areas. Climate change is anticipated to further exacerbate the country's susceptibility to these diseases. Growing urban populations are also faced with exposure to flood risks – in particular flash floods due to high intensity rain fall. Furthermore, Malaysia's coasts are also vulnerable to rising sea-levels – exposing coastal settlements and ecosystems to storm surges, coastal erosion and saline intrusion.</p> <p>Using the Coupled Model Intercomparison Project Phase 5 (CMIP5) models included under the IPCC's Fifth Assessment Report (AR5), key projected climate trends for Malaysia under the highest emission pathway (RCP 8.5), anticipate an average temperature increase of around 1.5°C by 2050 and 3°C by 2090. Higher emission pathways (RCP 6.0 and 8.5) project an increase in the mean annual number of hot days – although the increase is only statistically significant at the end of the century. Climate change, resilience and disaster risk reduction are key considerations for urban planning and management in</p>	<p>The risks will be mitigated related to charging infrastructure by ensuring that this infrastructure meets current international standards (see Component 2) and – where applicable – contracting will also include a clause on resilience to climate impacts.</p> <p>Project planning decisions, project design, and construction methods will take into account of the on-site implications of these climate hazards. The risks associated with climate change include extreme weather conditions will be addressed by ensuring that any infrastructure investment supported by the project is climate-proofed.</p>
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Environmental and social risk	Low	<p>The use of any type of electric vehicle may include environmental and social risks.</p> <p>The installation of solar panel for the EV charging demonstration and repurposing of used EV batteries might pose environmental risks without proper management and safe disposal of the materials after the shelf life has ended.</p>	<p>Consultation from vulnerable groups (women, refugees, the disabled, poor and elderly) will be sought when preparing policy recommendations under Component . Similar consultations will be held on the placement of e-chargers, and findings from the consultations will be integrated into the RFP (for example, the need for adequate lighting at the e-charging station).</p> <p>Through the development of Output 1.3, Development of Electric Vehicle and Sustainable Battery Ecosystem and Value Chain Roadmap, consideration for lifecycle issues related to PV and batteries including safe collection, recycling and disposal, will be taken into account. A set of guiding policies, regulations and standards considering the sustainable battery ecosystem will be proposed. Additionally, the project will also support building capacity of local stakeholders and operators to manage and safely dispose of batteries after their shelf life has ended.</p> <p>A complete Environmental and Social Management Plan has also been developed and included as an attachment.</p>
Technology risk	Low	<p>The introduction of new technologies carries a risk that they may not be suitable for the location and use intended.</p>	<p>The project will draw upon UNIDO's experience and the knowledge from Global programme on the suitability of e-mobility within the context of Malaysia.</p>

Operational risk	Low	Low interest to participate and engage project activities (from private sector, stakeholders from the government and municipalities) including political factors at the macro level	Project success depends on active participation and investment from the private sector. The project will have early engagement strategy, regular outreach with networks to keep the momentum (see Stakeholder Engagement Plan). The project team will disseminate the knowledge to ensure scalability of project beyond demonstration sites. Based on the demonstrated willingness of the Malaysia private sector to adopt and utilize e-vehicles, the risk of low participation from the private sector is considered low.
Social/Operational risk	Low	Low representation from women in positions of power and influence on the transport policy; inadequate engagement from women or missing qualified female technicians/entrepreneurs from the private sector.	<p>This risk will be mitigated through specifically targeting women involved in the sector for participation in consultations on policy improvements under Component 1, and for safety and other considerations under Component 2. Disaggregated data on gender participation will be collected at all meetings and other events related to the project, and targeted invitations will be made for enhanced female participation as needed.</p> <p>To ensure gender inclusiveness of all project activities, UNIDO methodology for gender assessment and gender responsive communication showing the benefits of gender equality for both women and men will be applied. To mainstream gender dimensions and empower women, adequate and gender responsive communication strategy will be implemented, and sensitization workshops will be organized. A full gender analysis was carried out and its recommendations were incorporated into the project design.</p>

COVID-19 Risks	Medium	<p>The project faces a variety of potential risks due to the COVID-19 pandemic. First, general trends in people's transportation preferences in response to COVID-19 could pose challenges to the project's objectives of increasing adoption rates of electric mobility and the project's implementation. The demonstration and awareness raising linked to the adoption of electric public transportation could be hindered due to less interest in public transportation from the public, in turn creating challenges for the viability of the business model. Reduced income from private sector and households could also impact financial decisions towards investing in new electric vehicles.</p> <p>The challenges from COVID-19 pandemic to Malaysia is constraining the implementation of planned climate change actions as many resources are being diverted for urgent needs to overcome the disease. Therefore, there are risks to mobilise/materialise co-financing during the project.</p>	<p>To mitigate this risk, the project will create linkages with international and national green recovery packages to build back the market towards electric mobility.</p> <p>Opportunities to create linkages between the projects objectives and recovery measures will be monitored regularly throughout the project's implementation. To address potential restrictions in the movement of people and goods as well as stakeholder consultations and site screening for technology demonstrations sites, the project will build into its work plan a certain amount of consideration for potential delays as well as flexibility in terms of planning the potential need to conduct capacity building and stakeholder engagement through online approaches. In addition, the project is designed to diversity this risk by not relying on one private sector stakeholder in each demonstration.</p> <p>Considering the development of the pandemic, it is anticipated that investment priorities will be evolving as communicated in the updated NDC. Stakeholder engagement will be critical to ensure wide-range buy-in and ownership for the project. As a mitigation measure, a detailed stakeholder engagement plan (see attached) has been developed and will be consistently reviewed and revised during implementation to ensure the project evolves with nationally needs and co-financing is secured.</p>
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Table 23: Project risks, risk levels and mitigation measures

Opportunity	Opportunity level	Opportunity optimization measure
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New business opportunities to build back better for business continuity and economic recovery post-COVID-19	High	<p>The project by design engages with the private sector to support the development of electric mobility, low carbon charging infrastructure and sustainable use of batteries. New business opportunities, policies and regulations will be included in entrepreneur training material so that they are fully informed of the market and policy environment trends.</p> <p>Data will be collected, analyzed and used during phases of the project (especially the demonstrations of the project) to develop innovative business models/opportunities, and digital innovations such as mobile applications to support the implementation of the project in the COVID era.</p>
New business opportunities created in response to COVID-19 related restrictions and measures	High	<p>Response to COVID-19 restrictions, such as remote working arrangements and no-contact business modalities will require solutions that can be turned into new business models. These opportunities will be analyzed at national and regional level and shared with entrepreneurs as part of market intelligence information.</p> <p>Data will be collected, analyzed and used during phases of the project (especially the demonstrations of the project) to develop innovative business models/opportunities, and digital innovations such as mobile applications to support the implementation of the project during the COVID era and restrictions</p>

Table 24: COVID Opportunity analysis

## 6. Institutional Arrangement and Coordination

### **Describe the institutional arrangement for project implementation. Elaborate on the planned coordination with other relevant GEF-financed projects and other initiatives.**

UNIDO, as a GEF Implementing Agency, will lead project preparation and development with participation from key Government entities and private sector stakeholders. The key ministry for the project's execution is the Ministry of Environment and Water (KASA). The Executing Agency is Malaysian Green Technology and Climate Change Centre (MGTC). MGTC has previous experience with UNIDO as a GEF Executing Agency for the operationally complete GEF-5 project, "Energy efficient and low-carbon transport in Malaysia" (GEF ID: 5741).

KASA will support MGTC in execution of the project by providing ministerial level support in the coordination of the project's activities across ministries and with key government stakeholders. As the executing agency, MGTC will also coordinate the execution of project delivery partners and experts through their procurement and recruitment processes. MGTC will host the Project Management Unit (PMU) that will be led by a National Project Director and responsible for the day-to-day management. The PMU will report to the PSC and UNIDO.

A Project Steering Committee (PSC) will be established to give strategic and operational guidance to the project while ensuring it is executed per the project document. This includes the PSC being consulted on matters relating to project budget and work plans, with any changes being done in accordance with the approved project document. The PSC's constitution will be formalized by the Government of Malaysia in coordination with the GEF Focal Point at the Ministry of Environment and Water (KASA) and include UNIDO, Ministry of International Trade and Industry (MITI), Ministry of

Transport (MOT), Ministry of Energy and Natural Resources (KeTSA), Ministry of Science, Technology and Innovation (MOSTI), Ministry of Housing and Local Government (KPKT), Ministry of Finance (MOF) and Economic Planning Unit.

The National Project Director (NPD) will be appointed by KASA. The NPD will be responsible for project monitoring in order to achieve project's objectives through the endorsement of all project reporting including submission of Annual Work Plans (AWP), APR/PIRs and financial reports by PMU. The NPD will oversee the effective communications and coordination with all parties involved in the project and will verify that resources committed to the project are available. This includes in-kind commitments, which will be monitored and reported during project reviews. The NPD will report to the NSC any issues, internal or external to the project, which are likely to effect the delivery of results.

The National Project Manager (NPM) will be the custodian of the Project Document and as such will be responsible for overseeing compliance with the agreed work plan and budget. The NPM will ensure that subsequent revisions to the Project Document are verified and approved by the PSC and in accordance with the requirements of the Government and GEF. The NPM will be responsible for the day-to-day delivery of the project activities in accordance with the agreed Project Document. The NPM will be appointed by executing agency and will report programmatically to the NPD and administratively to the UNIDO. The NPM establishes the project team, maintains the project management plan and facilitates procurement and scheduling of activities. The NPM prepares all project management and financial reports, and; ensures effective communication and coordination of the project team and partners; establishes the result monitoring systems and facilitates all project evaluations and reviews; and keeps track of project risks and issues in the project's risk and issues log.

The project team will work with project stakeholders to create and strengthen existing linkages with other agencies and actors presently planning or implementing relevant projects that could contribute to the final outcomes of this GEF project. The project team will actively identify relevant partners and engage in multiple stakeholder consultations to ensure related issues and concerns are considered in the implementation and management of the project. A comprehensive stakeholders' involvement plan will also be created to build on best practices and ensure lessons learned are incorporated by the project implementation team. A coordination mechanism will also be established to facilitate proper coordination and monitoring of the baseline project proponents.

The project Management Framework is given in the figure below:

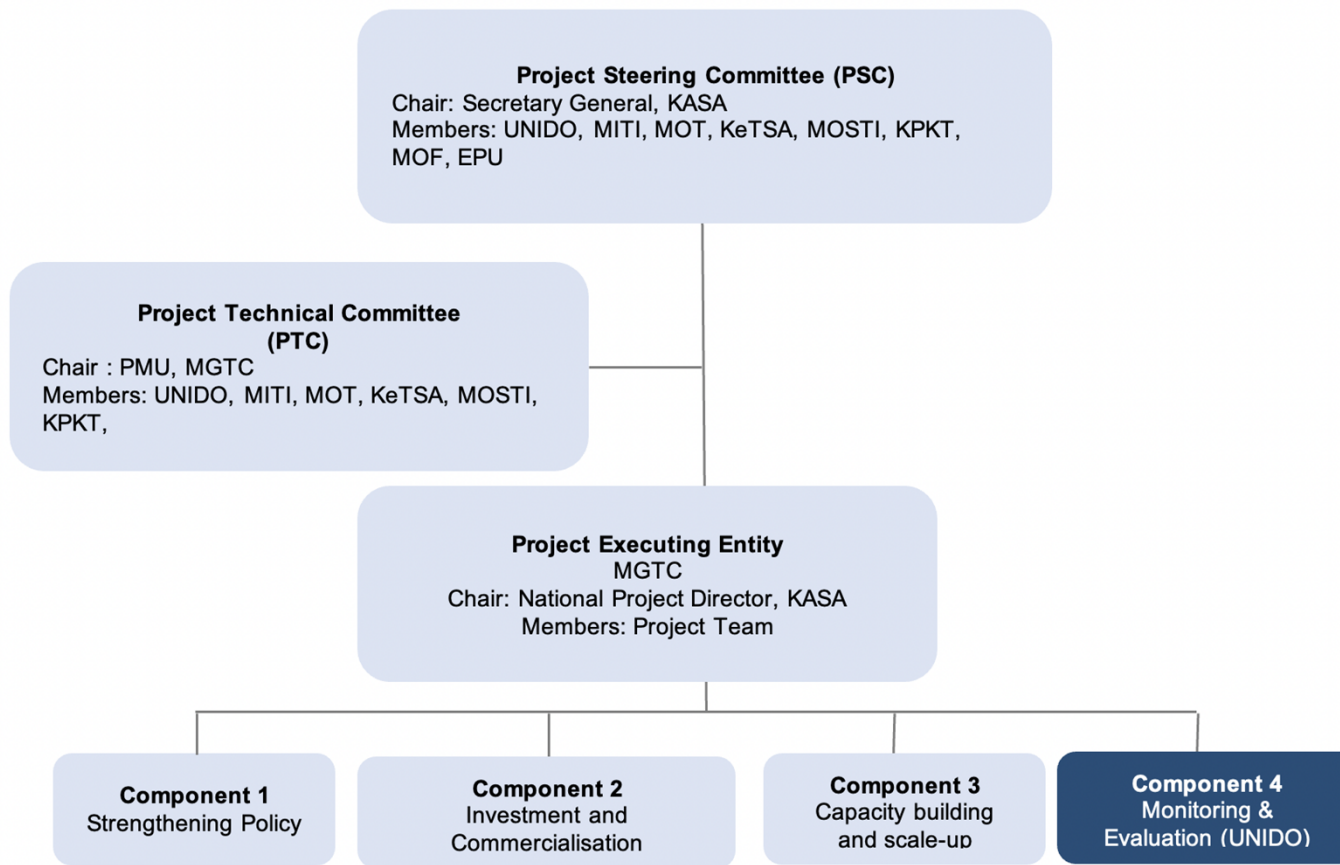


Figure 15: Project Management Framework

The project will be executed by the Malaysian Government with implementing partner being the Ministry of Water and Environment (KASA). The overall governing body will be the Project Steering Committee (PSC) which will be a multi-stakeholder body chaired by KASA. The PSC will include representation from sectoral ministries and beneficiaries.

The PSC will ensure the overall strategic consistency of the project and will provide high-level guidance, direction and key policy decisions needed to ensure the project is executed according to the work plan and budget in agreement with the Project Document.

The PSC shall approve and endorse the annual project work plan and budget, ensuring that resources are deployed to their most productive use and reporting to UNIDO and GEF is timely and accurate. Responsible for approving any minor changes in the Project Document and for alerting GEF secretariat to significant deviations. The GEF Secretariat must first approval significant changes in the Project Document.

1. Support the coordination with stakeholders and ensure the institutional support required from each participating entity;
2. Support mobilization of financing to ensure long-term sustainability of project activities; and
3. The PSC will, at all times, observe the UNIDO Rules and Regulations and GEF rules and procedures in making its decisions.
4. The PSC may establish working groups, as required, to facilitate its work.

5. The PSC will be chaired by either the Secretary General or Deputy Secretary General of KASA.
6. PSC will meet twice a year and on a more frequent ad-hoc basis if required.
7. Final PSC meeting should also be held at the end of project completion to agree to and endorse the final findings and outcomes of the project and to make recommendations towards project closure

#### Project Monitoring Committee (PMC)

PSC shall be supported by a Project Monitoring Committee (PMC) to monitor the physical and financial progress of the project. PMC will be monitored by NPD and Climate Change Division of KASA. PMC will be held monthly and shall provide:

1. Review of project progress report to ensure the objective of the projects been achieved and resources are deployed to their most productive use and comply the Annual Work Plans (AWP), APR/PIRs and financial procedure
2. Identifying difficulties impacting the community or project and finding solutions and assuring that all actions are completed correctly, on time, and by the appropriate persons.
3. Advise PMU the best approach to ensure project be implemented effectively and efficiently.

#### Project Technical Committee (PTC)

Due to the cross-cutting nature of implementing the adoption and scaling-up of Climate-Smart Transport in Malaysia, the PSC shall be supported by a Project Technical Committee (PTC) which will include multi-domain technical and policy specialist from participating ministries, project delivery partners and key stakeholder groups. This will include senior technical specialist from private sectors, universities, KASA, MOT, MITI, MOT, KeTSA, MOSTI, and KPKT. The PTC is not a decision-making body but will be called upon to provide objective and independent technical expertise to the PSC to support project oversight and monitoring. The PTC will do this by providing the PSC with an informed review of project management reports, technical reports and other outputs of the project. The PTC will meet biannually, prior to the PSC meetings and as otherwise required by PSC.

The PTC shall provide :

1. Strategic management and technical advice to project activities, including corrective actions required, alternative project strategies or implementation plans and resolve amicably any dispute as to the interpretation of the project document and the implementation of the project
2. Review and acceptance of project work plan and budget, ensuring that resources are deployed to their most productive use;
3. Oversee project progress against mandatory results and agreed time schedule of activities and reviewing the results of project evaluations that will take place periodically;
4. Provide necessary political support to the project implementation, assuring coordination between this project and other ongoing government activities and programs;
5. Perform other duties to ensure effective and efficient implementation of the project.

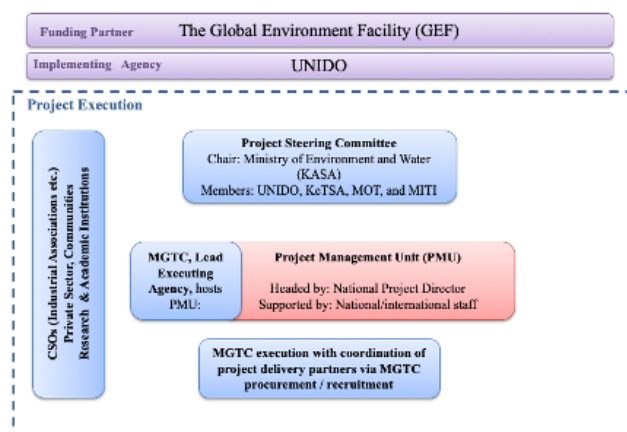


Figure 16: Institutional arrangement

The project development team will endeavour to establish and strengthen linkages with other agencies and actors that are currently planning or implementing relevant projects which will contribute to the overall outcome of the proposed GEF project. Some of such partners active in this area are local private entrepreneurs, CSOs and NGOs, academia, etc. The project development team will identify the most relevant partners during the project preparation phase. During the PPG stage, numerous stakeholders' consultation including the log frame analysis were organized to discuss related issues and concerns and prepare comprehensive structures for project implementation and management. A detailed stakeholders' involvement plan has been developed to ensure complementarity and build on best practices and lessons learned by the stakeholders. During the implementation stage, the coordination mechanism will be further established to ensure proper coordination and involvement of the baseline project proponents.

Stakeholders will form a comprehensive integrated structure to enhance a synergy among the project partners and serve as the knowledge source of new clean technologies, emerging entrepreneurs, knowledge network, applied research collaboration and additional team members. Furthermore, the gender mainstreaming approach will be applied in the form that early involvement of designated women entrepreneurs, associations and gender focal points will take part in all project activities. This is in line with the GEF Policy on Stakeholder Engagement that sets out the core principles and mandatory requirements for stakeholders' involvement.

The project will also have linkages with the Global and Regional Programs established under GEF-7. Concretely, this will include participating in capacity building activities, contributing to knowledge platforms with lessons gained from the project and replicating best practices from countries and regions shared through the platform. A specific output (3.1.3) is dedicated to establishing these linkages and ensuring bi-lateral engagement between the project and global and regional platform to leverage synergies and support scalability and replicability of best practices developed under the project.

#### ***Transfer of assets:***

Full or partial ownership of equipment/assets purchased under the project may be transferred to national counterparts and/or project beneficiaries during the project implementation as deemed appropriate by the government counterpart in consultation with the UNIDO Project Manager.

#### ***Legal Context:***

The Government of Malaysia agrees to apply to the present project, mutatis mutandis, the provisions of the Standard Basic Assistance Agreement between the United Nations Development Programme and the Government, signed and entered into force on 12 September 2012.

#### **7. Consistency with National Priorities**

Describe the consistency of the project with national strategies and plans or reports and assessments under relevant conventions from below:

NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc.

As a signatory nation to the Conference of Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC), Malaysia had communicated its updated Nationally Determined Contributions (NDC) to reduce its economy-wide carbon intensity (against GDP) of 45% in 2030 compared to 2005 level. The 45% of carbon intensity reduction target is unconditional and is an increase of 10% from the earlier submission. In addition, Malaysia's NDC covers 7 GHG instead of 3 GHG previously.

The project is fully in line with the most recent 'Third National Communication and Second Biennial Update Report'<sup>[1]</sup> which includes the measures:

'Energy Efficient Vehicles (EEV) through strategic investments and adoption of high technology for domestic market and to penetrate regional and global markets by 2020. The EEVs include fuel-efficient internal combustion engine (ICE) vehicles, hybrid vehicles, electric vehicles (EV) and alternative fuelled vehicles.'; and

'Electric Vehicles (Increase availability of electric vehicles in the market to reduce fuel consumption)' with a target of '100,000 electric cars and 100,000 electric motorcycles on-the-road by 2030'.

This project will support and contribute further towards realisation of the following National Priorities:

**12th Malaysia Plan**, Chapter 8 on Advancing Green Growth for Sustainability and Resilience set out strategies for Enhancing Green Mobility including encouraging private sector to invest in advancing next generation vehicles, technologies and supporting infrastructure, such as energy-efficient, hydrogen-powered and electric vehicles, and their charging stations. Chapter 12 outlined strategies on Enhancing Efficiency of Transport and Logistics Infrastructure with the aim to further enhance the efficiency of transport and logistics services by prioritising efforts to provide an integrated, affordable, reliable and seamless transport system. This project will support and contribute towards the goals of the macro development plan by implementing activities that are aligned to the strategies and measures outlined in the plan.

**Low Carbon Mobility Blueprint (LCMB)** that focuses on GHG mitigation and energy reduction in the transportation sector for Malaysia. This project will directly contribute towards LCMB Focus Area B on EV adoption for 3 vehicle segments which are passenger cars, buses and motorcycle. This will

also directly linked to LCMB action plan under EV Roadmap and National Electric Bus Roadmap. All three components of this project will enable the acceleration of EV adoption through strategic applications outlined under LCMB such as adoption electric buses for stage buses, feeder buses, communal service by municipalities (projects in Iskandar Malaysia and Kuching), battery swapping for motorcycle and ensuring RE-integrated smart charging to be adopted.

**NAP** that focuses on industry development of Next Generation Vehicle (including EV) with a vision for Malaysia to become a regional leader in manufacturing, engineering, technology and sustainable development in the automotive sector. This project will directly support Malaysia's policy on automotive that encourages investment, technology advancement and sustainable development.

**NTP** that focuses on sustainable transport sector that accelerates economic growth towards a green transport ecosystem and provides strategic direction for a sustainable transport sector. This project will enable action items under the policy for transport to be implemented. The project component 1.1.2 on public transport and freight master plan enhanced based on modelling and scanning of electric drive technology options will specifically be contributing towards NTP strategies on shifting land cargo freight to rail. This will also directly related to Land Public Transport Master Plan that focuses on urban rail (i.e. MRT, LRT and Monorail), bus and other supporting infrastructure (i.e. Bus Rapid Transit, Park n Ride bays, etc.), Logistics and Trade Facilitation Master Plan, Rail Industry Roadmap, Highway Development Plan.

**GTMP** that serves as the national strategic plan and implementation framework to catalyse green growth towards sustainable development and position Malaysia as a Green Technology hub by 2030. This project will contribute towards the implementation of EV as one of the action item under GTMP.

**National Solid Waste Management Policy** that looks into Reduce, Reuse and Recycle (3R) implementation plan for solid waste management. The project component 2.1.2 on demonstration of electric vehicles battery repurposing and recycling will enable EV batteries to be recovered and reused.

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<sup>[1]</sup> Available here:

[https://unfccc.int/sites/default/files/resource/Malaysia%20NC3%20BUR2\\_final%20high%20res.pdf](https://unfccc.int/sites/default/files/resource/Malaysia%20NC3%20BUR2_final%20high%20res.pdf)

## **8. Knowledge Management**

**Elaborate the "Knowledge Management Approach" for the project, including a budget, key deliverables and a timeline, and explain how it will contribute to the project's overall impact.**

Knowledge Management (KM) is an essential process in AASCT project management. As a start, critical data, information and knowledge collected from past projects such as GEF5-Energy Efficient Low-Carbon Transport in Malaysia (EELCT) implemented in 2016-2020 and UNDP/GEF project

Green Technology Application for the Development of Low Carbon Cities (GTALCC) will be transferred to the PMU. Local and international case studies and best practices collated under MGTC's repository on low carbon mobility including the data points will also be a crucial reference for the project. These important resources will ensure effective measures can be undertaken when implementing the project by drawing lessons learned and best practices from previous experiences.

MGTC as the host of the PMU has an existing document management tool that will be utilized by the PMU to systematically acquiring, preserving and sharing of information and knowledge throughout the course of project realization. Through this tool, data and information including documented experience can be stored and accessed to develop curated content for meaningful reporting to stakeholders such for review reports, presentation to Project Steering Committee and sharing of best practices at numerous platforms. A web portal for AASCT will also be established as a microsite to MGTC's portal and serves as knowledge sharing and dissemination of information to all stakeholders.

Under Component 3 on capacity building and scale-up, training of trainers will also be undertaken to develop a pool of competent pool of instructors who will be able to conduct knowledge sharing with other people in the future. This will enable sustainability through knowledge management.

A knowledge management plan will be developed to coordinate the gathering and distribution of all data, information and lessons learnt during the project's implementation. The plan will build on the measures put in place under the Low Carbon Mobility Blueprint and Action Plan (LCMB). The LCMB proposes the creation of a council to act as the national focal point for implementing and monitoring action on the document. This steering committee will also play a role in ensuring knowledge management between different stakeholder ministries and agencies.

The knowledge management plan will also include measures to ensure lessons learned and best practices are shared on a regional and global level. This includes connecting the project with the UNEP/IEA led GEF 7 Global Programme to Support Countries with the Shift to Electric Mobility. Regional connections would be further through the regional Support and Investment platforms managed by the Asian Development Bank. Additional connectivity with regional and national platforms will be actualized during implementation.

Additionally under this component, several activities are envisioned: i) Documentation of best practices and solutions; ii) Peer to peer learning within relevant stakeholders; iii) Communication strategy around the planning process and production of well-designed and easy to understand materials; iv) Tailored trainings for key actors in the planning and management process; v) Awareness-raising ; vi) Training, resources, and technical assistance to cities on data collection strategies, validating the information, and other analytic tools required for investment analysis; and vii) Media/communications, outreach, stakeholder engagement.

Component	Materials
Component 1	<ul style="list-style-type: none"> <li>? Study on standard document/guideline</li> <li>? Study on Mode Shift from Road to Rail</li> <li>? Study on the Landscape of EV Battery Ecosystem</li> <li>? Roadmap for implementation of sustainable EV battery ecosystem</li> <li>? Policy papers</li> </ul>
Component 2	<ul style="list-style-type: none"> <li>? Technical reports</li> <li>? Publicity in the media</li> </ul>

Component	Materials
<b>Component 3</b>	? Awareness raising materials ? Workshop proceedings ? Publicity in media ? List of participants (gender disaggregated) ? Minutes of Meeting ? Event Reports
<b>Component 4</b>	? Annual Project Implementation Report ? Progress reports ? Mid-term project review (MTR) document ? Project terminal evaluation

**Table 25: Knowledge management material by component**

## 9. Monitoring and Evaluation

### Describe the budgeted M and E plan

Project monitoring and evaluation (M&E) will be conducted in accordance with established UNIDO and GEF procedures. The overall objective of the monitoring and evaluation process is to ensure successful and quality implementation of the project by completing the following:

- i. Tracking and reviewing project activities execution and actual accomplishments;
- ii. Providing visibility into progress as the project proceeds so that the implementation team can take early corrective action if performance deviates significantly from original plans;
- iii. Adjusting and updating project strategy and implementation plan to reflect possible changes on the ground, results achieved and corrective actions taken; and
- iv. Ensuring linkages and harmonization of project activities with that of other related projects at national, regional and global levels.

According to the Monitoring and Evaluation policy of the GEF and UNIDO, follow-up studies like Country Portfolio Evaluations and Thematic Evaluations can be initiated and conducted. All project partners and contractors are obliged to (i) make available studies, reports and other documentation related to the project and (ii) facilitate interviews with staff involved in the project activities. At the same time, M&E will comply with the rules and regulations governing the M&E of UNIDO technical cooperation projects, in particular the UNIDO Evaluation Policy and the Guidelines for Technical Cooperation, both in their respective current versions.

A detailed monitoring plan for tracking and reporting on project time-bound milestones and accomplishments will be prepared by the PEE and UNIDO at the beginning of project implementation and then periodically updated. By making reference to the impact and performance indicators defined in the Project Results Framework, the monitoring plan will track, report on and review project activities and accomplishments.

The PEE will be responsible for day-to-day execution and management of project activities and monitoring the execution, performance and the tracking of progress towards the achievement of milestones.

The PEE will be responsible for narrative reporting to the GEF, and the preparation of draft Annual Project Implementation Reviews (PIR) that will be submitted to the GEF by UNIDO. UNIDO will be responsible for oversight and tracking overall project milestones and progress towards the attainment of the set project outputs.

Mid-term project review and terminal project evaluation (TE) will be prepared by an independent evaluator as established in the M&E Plan.

One mid-term project review will be carried out and a final independent terminal project evaluation at least one month before the completion of the project. UNIDO execute independent mid-term review and terminal evaluation of the project. The UNIDO project manager will inform UNIDO Evaluation Group at least 6 months before project completion about the expected timing for the terminal project evaluation. The UNIDO Evaluation Group will then manage the terminal evaluation in close consultation with the project manager.

All monitoring and evaluation documents, such as progress reports, terminal evaluation report, and thematic evaluations (e.g., capacity needs assessment), as well as publications reporting on the project, will include gender dimensions wherever adequate. Table 8 provides the tentative budget for monitoring and the two evaluations, which has been included in Output 4.1 of Project Component 4. UNIDO as the Implementing Agency will involve the GEF Operational Focal Point and project stakeholders in order to ensure the use of the evaluation results for further planning and implementation.

The M&E plan will encompass monitoring of the Gender Analysis Report and Gender Mainstreaming action plan.

<b>Type of M&amp;E Activity</b>	<b>Responsibility</b>	<b>Budget (USD)</b>	<b>Remarks</b>	<b>Timeframe</b>
Inception Workshop (IW) and inception report	PMU	Incl. in the contract arrangement with national execution partner MGTC		Within first two months of project start up
M&E design and tools to collect and record data (performance indicators) including a survey to confirm baseline values for industry, manufacturers, policy makers, gender, etc.	PMU			Within first two months of project start up and mid project
Regular monitoring and analysis of performance indicators (technical, social, policy, environmental, gender)	PMU			Regularly to feed into project management and Annual Project Review
Project Implementation Reviews (PIRs) including lessons learned?	PMU (for data collection and drafting) and UNIDO (to final report and submission to GEF)			Annually

Type of M&E Activity	Responsibility	Budget (USD)	Remarks	Timeframe
Annual Project Review to assess project progress and performance	PMU			Annually prior to the finalization of APR/PIR and to the definition of annual work plans
Steering Committee (SC) Meetings	PMU, UNIDO Project Steering Committee		It will be part of PMU activity	Annually to coincide with the Annual Project Review and ad hoc when urgent and important decisions need approval of SC
Mid-term project review including survey to measure progress against baseline for investments, trainings and policy makers	PMU, external consultants, UNIDO PM, UNIDO Quality Monitoring Division in advising on TOR and selection of evaluators, Steering Committee and M&E specialists as required	39,986	Indicative cost	Mid of project
Final survey to measure progress against baseline for projects	UNIDO PM; PMU and M&E specialists as required	40,000	It will be part of PMU activity	At least two months prior to end of the project
Project terminal evaluation	UNIDO Independent Evaluation Division, PMU, PM UNIDO HQ and Project Steering Committee, independent external evaluators		Indicative cost	Evaluation at least one month before the end of the project; report at the end of project implementation
Visits to field sites	PMU, PM		It will be part of PMU activity	As required, throughout the project
<b>Total budget:</b>		79,986		

Table 26: Project's Indicative Monitoring and Evaluation Work Plan

#### 10. Benefits

**Describe the socioeconomic benefits to be delivered by the project at the national and local levels, as appropriate. How do these benefits translate in supporting the achievement of global environment benefits (GEF Trust Fund) or adaptation benefits (LDCE/SCCF)?**

The project will create socio-economic benefits at that national and local level by supporting Malaysia's electric vehicle market continue to develop, in turn creating co-benefits in the form of new jobs along the EV value chain in Malaysia, a reduction in Malaysia's contribution to GHG emissions globally, and improvements in national and local air quality. Electric vehicles have emerged as a key technological solution to decarbonizing the transport sector and Malaysia's decision to pursue development of their own EV automotive sector nationally creates synergies to meet climate targets while creating opportunities for people to work, develop new technological skills and improve the quality of life in local communities. The project supports this through the development of support programme for entrepreneurs and SMEs working on electric mobility, and supports inclusivity by dedicated attention to women entrepreneurs working in the space and support opportunities for women to work in the labour market in Malaysia. From a gender perspective, the project also supports development of safe, clean and efficient transport for men and women, in turn supporting economic growth by reducing travel time and providing reliable modes of transport through new proposed policy and planning measures. Please see the ESMP for further details.

**11. Environmental and Social Safeguard (ESS) Risks**

Provide information on the identified environmental and social risks and potential impacts associated with the project/program based on your organization's ESS systems and procedures

**Overall Project/Program Risk Classification\***

PIF	CEO Endorsement/Approval	MTR	TE
Medium/Moderate	Medium/Moderate		

**Measures to address identified risks and impacts**  
Elaborate on the types and risk classifications/ratings of any identified environmental and social risks and impacts (considering the GEF ESS Minimum Standards) and any measures undertaken as well as planned management measures to address these risks during implementation.

Please refer to the attached Environmental and Social Management Plan for the project.

E&S risks	Mitigating Measure	Location	Timeline, including frequency, start and end date	Responsibility
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E&S risks	Mitigating Measure	Location	Timeline, including frequency, start and end date	Responsibility
<p><i>Health risks related to Covid-19 pandemic and its impact on:</i></p> <ul style="list-style-type: none"> <li>- <i>Working arrangements</i></li> <li>- <i>Restrictions on face-to-face meetings</i></li> <li>- <i>National and international travel restrictions</i></li> <li>- <i>Government priorities shift</i></li> <li>-</li> </ul>	<p>The project will fully consider the negative implications of COVID-19 and identify the most appropriate ways to conduct implementation by using safety measures and preventive precautionary procedures. Such as organizing virtual meetings and trainings where face-to-face meetings bear health risks. The project team will be in continuous consultations with the governmental project stakeholders on how COVID-19 could impact the implementation of project activities and additional challenges that may subsequently arise due to the national pandemic restrictions. That would be pinned in the project schedule to accommodate to the prolongation of activities implementation and mobilization challenges during the pandemic period. See <a href="#">UNIDO's COVID-19 Response</a> for further details.</p>	<p><i>Global</i></p>	<p>Continuously during project implementation</p>	<p>PEE (MGTC)/PMU</p>

E&S risks	Mitigating Measure	Location	Timeline, including frequency, start and end date	Responsibility
Generation and insufficient treatment of wastes in construction phase of pilot demonstration	Project designed to reduce waste generation Implementation of wastes collectors and evacuation of wastes to adapted treatment sites	Pilot demonstration sites	At project design Occasionally during pilot demonstration implementation, and more specifically at the end of works	PEE (MGTC), Municipalities and/or pilot demonstration partners
Air pollution (health risk) to workers and population in construction phase of pilot demonstration	<ul style="list-style-type: none"> <li>- Adapted working hours, for air polluting activities</li> <li>- Installation of collective protection equipment, such as barriers</li> </ul> Installation of individual protection equipment: masks	Pilot demonstration sites	Occasionally during pilot demonstration implementation,	PEE (MGTC), Municipalities, and/or pilot demonstration partners
Noise pollution (health risk) to workers and population in construction phase of pilot demonstration	<ul style="list-style-type: none"> <li>- adapted working hours, for noisy activities, if the noise is higher than 50dB</li> <li>- ear protection for workers</li> <li>- The noise should not be higher than 85dB</li> </ul>	Pilot demonstration sites	Occasionally during pilot demonstration implementation	PEE (MGTC), Municipalities and/or pilot demonstration partners
Accidents in construction and operational phase of pilot demonstration	<ul style="list-style-type: none"> <li>- Installation of collective protection equipment, such as barriers</li> <li>- Installation of individual protection equipment: helmet, safety shoes</li> </ul>	Pilot demonstration sites	Continuously during pilot demonstration implementation	PEE (MGTC), Municipalities and/or pilot demonstration partners

<b>E&amp;S risks</b>	<b>Mitigating Measure</b>	<b>Location</b>	<b>Timeline, including frequency, start and end date</b>	<b>Responsibility</b>
Land use in Construction and operational phase of pilot demonstration	The technical studies of pilot project will favour implementation with no or limited land use change (roofs, carports, sterile lands?)	Pilot demonstration sites	Ongoing, during pilot demonstration implementation and lifetime	Engineering office, Municipalities
Disturbance to traffic and difficulties to access risks	The design studies and specification of pilot demonstration will include mitigating measures (specific to each site). The works within municipalities will be design to avoid difficulties to access local services.	Pilot demonstration sites	Intermittently during pilot demonstration implementation and possibly lifetime	Engineering office, Municipalities

E&S risks	Mitigating Measure	Location	Timeline, including frequency, start and end date	Responsibility
Health risks from technological risks associated with EV (electroshock, fire in certain situations such as accidents?)	Even though the project will not directly procure equipment, technical assistance will be provided for the demonstration project (e.g., procurement plan, feasibility studies) and will consider equipment safety and quality certificates guided by UNIDO procurement policies and the best international experience on construction and operation as well as national regulations. The trainings on operating and maintenance of EVs will include health and safety measures (e.g., electrical safety).	Malaysia	Continuously during project implementation	PEE (MGTC)

E&S risks	Mitigating Measure	Location	Timeline, including frequency, start and end date	Responsibility
Climate change risks - Infrastructure developed is vulnerable to climate risks.	<p>The climate induced risks will be mitigated especially those related to charging infrastructure by ensuring that this infrastructure meets current international standards (see Component 2) and ? where applicable ? contracting will also include a clause on resilience to climate impacts.</p> <p>Project planning decisions, project design, and construction methods will take into account on-site implications of these climate hazards (drought, extreme heat, floods, etc. ? please see Section 6 for additional climate risks). The risks associated with climate change include extreme weather conditions, which will be addressed by ensuring that any infrastructure investment supported by the project is climate-proofed/resilient. For instance, the location of technologies (e.g., charging stations) will take into consideration flood risks.</p>	Malaysia	Continuously during project implementation	PEE (MGTC)/PMU

E&S risks	Mitigating Measure	Location	Timeline, including frequency, start and end date	Responsibility
<i>Environmental impact from disposal of EV?s batteries</i>	<p>Environmental laws and regulations can mitigate the environmental effects from EV?s batteries.</p> <p>The project components address the problem of sustainability considering local ecosystems, so the realization of the project should effectively decrease the risk of environmental change.</p>	<i>Malaysia</i>	<i>During and after the project?s implementation</i>	PEE (MGTC)/PMU

E&S risks	Mitigating Measure	Location	Timeline, including frequency, start and end date	Responsibility
<p>Potential adverse impacts of the intervention on women, e.g. due to an inequitable access to project benefits.</p>	<p>This risk will be mitigated through specifically targeting women involved in the sector for participation in consultations on policy improvements under Component 1, and for safety and other considerations under Component 2. Disaggregated data on gender participation will be collected at all meetings and other events related to the project, and targeted invitations will be made for enhanced female participation as needed. The project will follow thorough gender responsive communication and ensure stakeholder involvement at all levels, with special regard to involving women and men, as well as civil society and non-governmental organizations promoting gender equality.</p> <p>The project team will collect and compile qualitative and quantitative gender-disaggregated data from the industries and from authorities along project implementation in order to better inform the policy</p>	<p>Malaysia</p>	<p>Continuously during project implementation</p>	<p>PEE (MGTC)/PMU</p>

E&S risks	Mitigating Measure	Location	Timeline, including frequency, start and end date	Responsibility
<p><i>Low representation/participation from women in positions of power and influence on the transport policy; inadequate engagement from women or missing qualified female technicians from the STEM sector.</i></p> <p><i>See Project's Gender Plan for Electric Mobility.</i></p>	<p>This risk will be mitigated through specifically targeting women involved in the sector for participation in consultations on policy improvements under Component 1, and for safety and other considerations under Component 2.</p> <p>Disaggregated data on gender participation will be collected at all meetings and other events related to the project, and targeted invitations will be made for enhanced female participation as needed. The project will follow thorough gender responsive communication and ensure stakeholder involvement at all levels, with special regard to involving women and men, as well as civil society and non-governmental organizations promoting gender equality.</p> <p>The project team will collect and compile qualitative and quantitative gender-disaggregated data from the industries and from authorities along project implementation</p>	<p><i>Malaysia</i></p>	<p>Continuously during project implementation</p>	<p>PEE (MGTC)/PMU</p>

E&S risks	Mitigating Measure	Location	Timeline, including frequency, start and end date	Responsibility
<i>The project promotes the shift to e-mobility however adding new cars on the roads can have the risk of contributing to traffic congestion in cities as well as have impacts on electricity demand.</i>	Under Component 1, the project will support policies prioritizing public transport as well as replacing polluting fossil fuel cars with EVs	Malaysia	Continuously during project implementation	PEE (MGTC)/PMU

Table 27: Summary of E&S Risks and Mitigation Measures

#### Supporting Documents

Upload available ESS supporting documents.

Title	Module	Submitted
190393_ESMP_Malaysia_e-mobility_07022022	CEO Endorsement ESS	
Malaysia_EV_190393_ESS	Project PIF ESS	
DIRECT AND INDIRECT EMISSION REDUCTION CALCULATION MALAYSIA 18Jan2021	Project PIF ESS	
Theory of change - Malaysia 18Jan2021	Project PIF ESS	

**ANNEX A: PROJECT RESULTS FRAMEWORK** (either copy and paste here the framework from the Agency document, or provide reference to the page in the project document where the framework could be found).

Project Strategy	Objectively verifiable indicators (quantified) <sup>[1]</sup>	Base line	Target at end of project	Sources of Verification	Global Programme Indicator	Remarks
<b>Objective :</b> To enhance the ecosystem in Malaysia for accelerated adoption of electric vehicles and support the implementation of national policy promoting reductions in transport related greenhouse gas emissions .	Direct GHG emissions reduced from integration of EVs with RE and from scale-up of EV use beyond business as usual, based on the project demonstration (tons CO2)	0	<b>Direct:</b> 120,002 tCO2e  <b>Direct secondary:</b> 10,206,752 tCO2e	? Demonstration monitoring report		
	Indirect GHG emissions reduced from integration of EVs with RE and from scale-up of EV use beyond business as usual, based on replication of the project demonstrations (tons CO2)	0	<b>Indirect:</b> 19,650,532 tCO2e	? Records of replication in other locations and original demonstration location		

Project Strategy	Objectively verifiable indicators (quantified) <sup>(1)</sup>	Baseline	Target at end of project	Sources of Verification	Global Programme Indicator	Remarks
	Amount of RE used to charge EVs in Malaysia (both direct via project demonstration and indirect via replication of demonstration) (MW)	0	<b>Capacity installed: 4.1 MW</b>	? Demonstration monitoring report  ? Records of replication in other locations and original demonstration location		
	Energy saved in Malaysia (both direct via project demos and indirect via replication of demos)	0	<b>Direct energy savings: 124,037,818,201 MJ</b>  <b>Indirect energy savings: 273,312,999,503 MJ</b>  <b>Total energy savings: 394,576,965,717 MJ</b>	? Demonstration monitoring report  ? Records of replication in other locations and original demonstration location		
	Number of direct beneficiaries disaggregated by gender as co-benefits of GEF investment	0	<b>Women: 5000</b> <b>Men: 5000</b>	? Monitoring report		
<b>Component 1. Strengthening the national policy and institutional frameworks into implementation of up-scaling electric mobility adoption and sustainable battery use</b>						
<b>Outcome 1.1</b> Policy environment, institutional and regulatory framework implementation for low carbon transport enhanced in a gender-responsive manner						

Project Strategy	Objectively verifiable indicators (quantified) <sup>[1]</sup>	Base line	Target at end of project	Sources of Verification	Global Programme Indicator	Remarks
<b>Output 1.1.1</b> Implementation guidelines and standards for smart charging to maximize renewable energy for charging and harmonization of electric vehicle charging protocol	Number of guidelines endorsed by stakeholders for adoption;  Chapter on gender mainstreaming in policy and regulatory framework with National and International Commitment developed with inputs from associations/ organisations that promote GEEW	0	At least 1 study on standard document/guideline for the purpose of harmonization of EV charging protocol is produced and endorsed by stakeholders. This study includes one chapter on gender mainstreaming in policy and regulatory framework with National and International Commitment and has been developed with inputs from at least 2 associations/ organizations that promote GEEW	? Project records official submission of proposed guidelines to government  ? Project progress reports	National Electric Vehicle Policy Committee endorses a policy to promote low-carbon electric mobility	A number of guidelines and standards for EV charging has been developed. Harmonization of these documents are required. In addition, specific guidelines and standards for smart charging integrated to Renewable Energy needs to be produced for Malaysia

Project Strategy	Objectively verifiable indicators (quantified) <sup>[1]</sup>	Baseline	Target at end of project	Sources of Verification	Global Programme Indicator	Remarks
<b>Output 1.1.2.</b> Public transport and freight master plan enhanced based on modelling and scanning of electric drive technology options	Number of study and policy recommendations proposed for mode shift from road to rail for both passenger and freight including analysis of gender dimensions of the mode shift.	0	At least 1 study on Mode Shift from Road to Rail is produced; with inclusion of chapter on gendered needs, priorities, mobility and travel patterns identified, mapped and analyzed  At least 2 policy papers produced (1 for passenger and 1 for freight)	? Project records official submission of proposed policies to Malaysia's Public Transport and Master Plan  ? Project progress reports	National Electric Vehicle Policy Committee endorses a policy to promote low-carbon electric mobility	The mode share for rail-based freight transport only stood at 2% for the land sector. The sole service provider in Malaysia, KTMB only utilises 30% of its infrastructure capacity.
	Number of incentive schemes established and endorsed by stakeholders	0	At least 1 Incentive Scheme established	? Project record official submission of proposed incentives to government  ? Project progress reports	National Electric Vehicle Policy Committee endorses a policy to promote low-carbon electric mobility	
<b>Output 1.1.3</b> Development of electric vehicle and sustainable battery ecosystem and value	Number of studies on the landscape of sustainable EV battery to be produced	0	At least 1 study on the Landscape of EV Battery Ecosystem (including talent, expertise, facilities, etc.) is developed	? Project record official submission of study to government  ? Project progress reports		Several policies are addressing circular economy in the automotive sector such as NAP 2020, National

Project Strategy	Objectively verifiable indicators (quantified) <sup>[1]</sup>	Base line	Target at end of project	Sources of Verification	Global Programme Indicator	Remarks
chain roadmap	Number of roadmaps on implementation of sustainable EV battery ecosystem	0	At least 1 roadmap for implementation of sustainable EV battery ecosystem is produced including gender sensitive measures recommended/adopted in the EV business model	? Project record official submission of roadmap to government  ? Project progress reports	National Electric Vehicle Policy Committee endorses a policy to promote low-carbon electric mobility	Remanufacturing policy (NRP), LCMB, EV Roadmap and skills competencies related to the activities (such as MS 2697:2018 (4R), NOSS ? Remanufacturing, NOSS-ELV: Parts & Component Salvage). Specific EV battery
<b>Component 2. Investment and Commercialization of Electric Mobility Technologies</b>						
<b>Outcome 2.1 Technology innovation with electric mobility supported and financed</b>						
<b>Output 2.1.1</b> Development of business models and deployment of renewable energy based smart charging	Demonstration of RE-based charging stations for EVs will be designed, installed and tested at 3 sites in Cyberjaya, Iskandar Malaysia and Kuching.	0	At least 6 PV-based charging stations designed, installed and tested in a gender-responsive manner	? Technical reports  ? Publicity in the media  ? Project progress reports	Global Programme Indicator 3.2  Malaysia generates evidence of the technical, financial and/or environmental benefits of low-carbon electric mobility	PV-based EV charging demonstration using local solutions need to be explored as the present solutions from foreign technologies are limiting repairs when facing issues or the need for further R&D

Project Strategy	Objectively verifiable indicators (quantified) <sup>[1]</sup>	Baseline	Target at end of project	Sources of Verification	Global Programme Indicator	Remarks
<b>Output 2.1.2</b> Demonstration of EV battery repurposing and recycling	Number of technology solutions identified for EV repurposing	0	At least 1 technology solution for battery State of Charge (SoC) and State of Health (SoH) is developed	? Technical reports ? Publicity in the media ? Project progress reports	Global Programme Indicator 3.2 Malaysia generates evidence of the technical, financial and/or environmental benefits of low-carbon electric mobility	Only pockets of initiatives on battery repurposing and recycling are conducted at institution level. Demonstrations are limited within private sectors
	Number of prototypes of EV battery second life applications	0	At least 1 prototype of EV second life application is developed	? Technical reports ? Publicity in the media ? Project progress reports	Global Programme Indicator 3.2 Malaysia generates evidence of the technical, financial and/or environmental benefits of low-carbon electric mobility	

Project Strategy	Objectively verifiable indicators (quantified) <sup>[1]</sup>	Base line	Target at end of project	Sources of Verification	Global Programme Indicator	Remarks
<b>Output 2.1.3</b> Development of business models and deployment of electric vehicle battery swapping technology.	Demonstration on the commercial viability of EV battery swapping technology for EV micro-mobility solutions.	0	At least 1 technology demonstration conducted and social impact analyzed	? Technical reports ? Publicity in the media ? Project progress reports	Global Programme Indicator 3.2 Malaysia generates evidence of the technical, financial and/or environmental benefits of low-carbon electric mobility	International standard IEC 62840-2 (Electric vehicle battery swap system) has not been adopted and localized to Malaysia.
<b>Component 3. Capacity Building and Scale-up</b>						
<b>Outcome 3.1</b> Strengthened local knowledge-base and scale-up of electric mobility regionally and internationally						
<b>Output 3.1.1</b> Targeted training for municipal governments and private sector on electrifying fleets, charging infrastructure and sustainable use of batteries	Number of awareness raising materials developed (materials should be gender-responsive)	0	Awareness raising materials available on EVs (materials should be gender aware)	? Workshop proceedings ? Publicity in media ? Project progress reports		
	Number of workshops and seminars organized (% of women participants);	0	At least 3 workshops and seminars organized (at least 40% women participants);	? List of participants (gender disaggregated) ? Minutes of Meeting ? Event Reports		

Project Strategy	Objectively verifiable indicators (quantified) <sup>[1]</sup>	Base line	Target at end of project	Sources of Verification	Global Programme Indicator	Remarks
	% of counterparts taking part in the development of study report having benefitted from built capacity and raised awareness	0	At least 70% of counterparts taking part in the development of policy papers report having benefitted from built capacity.	? List of participants (gender disaggregated) ? Minutes of Meetings ? Event Reports		
<b>Output 3.1.2</b> Training / workshops supporting development of electric vehicle and sustainable battery ecosystem and value chain with a focus on women participation	Number of awareness raising materials developed (materials should be gender-responsive)	0	Awareness raising materials available on EVs (materials should be gender-responsive)	? Workshop proceedings ? Publicity in media ? Project progress reports		
	Number of workshops and seminars organized (% of women participants);	0	At least 3 workshops and seminars organized (at least 40% women participants);	? List of participants (gender disaggregated) ? Minutes of Meeting ? Event Reports		
	% of counterparts taking part in the development of study report having benefitted from built capacity and raised awareness	0	At least 70% of counterparts taking part in the development of policy papers report having benefitted from built capacity.	? List of participants (gender disaggregated) ? Minutes of Meetings ? Event Reports		

[illegible]

Project Strategy	Objectively verifiable indicators (quantified) <sup>[1]</sup>	Base line	Target at end of project	Sources of Verification	Global Programme Indicator	Remarks
<b>Output 4.1.1</b> Monitoring and mid-term review	Annual project implementation reports (PIR) developed and submitted to the GEF including progress on the gender mainstreaming strategy and action plan including the following:  ?	0	5	? Annual PIRs ? All the progress reports include the progress on the implementation of the gender mainstreaming strategy and action plan.		
	Mid-term project review conducted	0	1	? Mid-term project review (MTR) document		
<b>Output 4.1.2</b> Project terminal evaluation	Independent project terminal evaluation conducted	0	1	? Project terminal evaluation		

<sup>[1]</sup> Sex-disaggregated wherever possible.

**ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).**

GEF Secretariat comment at PIF approval	UNIDO Response
No additional comments or recommendations received at the time of PIF approval.	N/A

**ANNEX C: Status of Utilization of Project Preparation Grant (PPG). (Provide detailed funding amount of the PPG activities financing status in the table below:**

<i>Project Preparation Activities Implemented</i>	<i>GETF/LDCF/SCCF Amount (\$)</i>		
	<i>Budgeted Amount</i>	<i>Amount Spent To date</i>	<i>Amount Committed</i>
<i>1100 - International consultants</i>	<i>18,000</i>		<i>18,000</i>
2100 ? Contractual services	32,000	32,000	0
<b>Total</b>	50,000	32,000	18,000 <sup>[1]</sup>

<sup>[1]</sup> Remaining funds will support ongoing stakeholder engagement between PPG and start of project implementation.

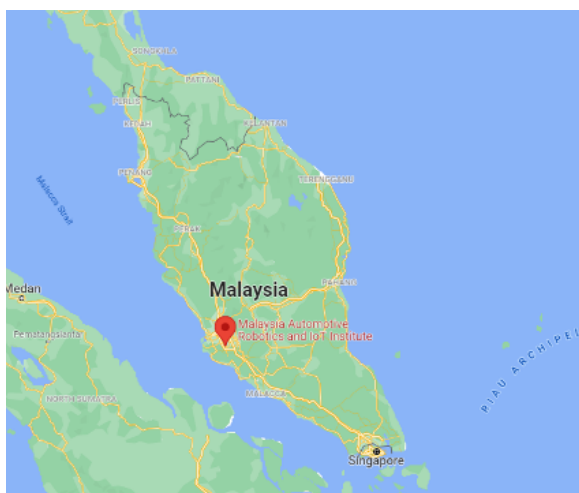
## **ANNEX D: Project Map(s) and Coordinates**

**Please attach the geographical location of the project area, if possible.**

### **Demonstration Cities**

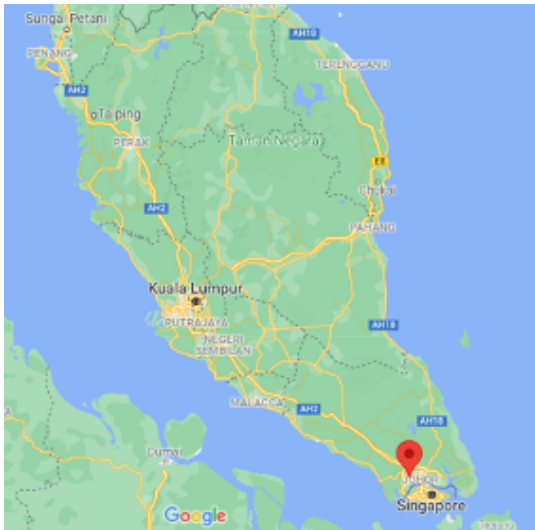
Based on the stakeholder discussions, strong interest and high potential for replication, three demonstration cities have been chosen at Cyberjaya, Iskandar Malaysia and Kuching. These locations offer unique potential for raising awareness, increase knowledge and multiple stakeholder involvement in the respective places.

### **Proof of Value for Electric Vehicle Inter-operability Center (EVIC): Vehicle-to-Infrastructure (V2I) in Cyberjaya**



Geographical Location for Proof of Value for Electric Vehicle Inter-operability Center (EVIC):  
Vehicle-to-Infrastructure (V2I) in Cyberjaya  
(Coordinates: 2.903136, 101.651169)

### **Renewable Energy Smart Charging Demonstration Project for Iskandar Malaysia Bus Rapid Transit (IRT) in Skudai, Johor**



Geographical Location for Renewable Energy Smart Charging Demonstration Project for Iskandar Malaysia Bus Rapid Transit (IRT) in Skudai, Johor  
(Coordinates: 1.5633722817996432, 103.65550075719715)

### **Solar Smart Electric Bus Charging Infrastructure and Depot Demonstration for Metro Kuching at Demak Laut Industrial Park, Kuching, Sarawak**



Geographical Location for Renewable Energy Smart Charging Demonstration Project for Kuching Metro at Demak Laut Industrial Park in Kuching, Sarawak  
(Coordinates: 1.5928386316765086, 110.40893616062701)

### **Development of EV Battery Repurposing and Recycling Value-Chain and Demonstration Project on Remanufacturing of EV Battery**



Geographical Location for Remanufacturing of EV Battery Demonstration Project in Cyberjaya  
(Coordinates: 1.5633722817996432, 103.65550075719715)

## ANNEX E: Project Budget Table

Please attach a project budget table.

Indicative Budget (please refer to attachment for more detailed budget)

Sum of Budget (USD)	Column Labels					
Row Labels	Component 1	Component 2	Component 3	M&E	PMC	Grand Total
<b>UNIDO</b>				79,986		79,986
International consultants				52,790		52,790
Independent Mid-term review conducted				26,390		26,390
Independent terminal evaluation at the end of the project				26,400		26,400
Local consultants				27,196		27,196
Independent Mid-term review conducted				13,596		13,596
Independent terminal evaluation at the end of the project				13,600		13,600
<b>MGTC</b>	400,000	1,000,000	135,000		161,498	1,696,498
Contractual Services ? Company	150,000	920,000				1,070,000
Development of guidelines/standards for smart charging and harmonization of EV charging protocol	50,000					50,000
Installation of Solar Smart Charging Demonstration units with three main components: solar PV panels, battery storage and fast chargers		455,000				455,000
Deployment of technology solutions (including proprietary technologies, experts, facilities, operation and maintenance, management and administration)		75,000				75,000
Deployment of prototypes for EV battery second life applications		75,000				75,000
Study on the landscape of EV and EV battery ecosystem	50,000					50,000

Demonstration of EV smart-charging proof of concept for electric vehicles linked to renewable energy		200,000				200,000
Study on inventory of carbon emissions before and after deployment of e-bus and smart charging specification		50,000				50,000
Study on Solar Smart Charging specification for Electric Bus		15,000				15,000
Develop standard and guidelines for EV battery recycling and repurposing in Malaysia		50,000				50,000
Development of calculation methodology for EV value chain based on Well-to-Wheel concept	50,000					50,000
Local consultants	200,000	74,000	5,000		132,800	411,800
PMU - National Project Assistant					48,000	48,000
PMU - National Project Coordinator					84,800	84,800
Targeted training for municipal governments and private sector on electrifying fleet, charging infrastructure and sustainable use of batteries			5,000			5,000
Study on Mode Shift from Road to Rail, including mode shift incentive scheme	200,000					200,000
Demonstration on EV battery swapping technology for motorcycle		68,000				68,000
Development of Standards and Guideline for EV battery swapping		6,000				6,000
Office supplies					12,098	12,098
PMU - Office Supplies					7,400	7,400
PMU - Non-expendable equipment					4,698	4,698
Training/workshop/meeting	38,000	4,500	35,000			77,500
Targeted training for municipal governments and private sector on electrifying fleet, charging infrastructure and sustainable use of batteries			15,000			15,000
Training / workshops supporting development of electric vehicle and sustainable battery ecosystem and value chain with a focus on women participation			20,000			20,000
Study on Mode Shift from Road to Rail, including mode shift incentive scheme	38,000					38,000
Demonstration on EV battery swapping technology for motorcycle		1,500				1,500
Development of Standards and Guideline for EV battery swapping		3,000				3,000
Travel	12,000	1,500	95,000		16,600	125,100
PMU - Travel to workshops / project sites					16,600	16,600
Knowledge exchange and scale-up through participation in regional and international platforms			95,000			95,000
Study on Mode Shift from Road to Rail, including mode shift incentive scheme	12,000					12,000
Demonstration on EV battery swapping technology for motorcycle		500				500
Development of Standards and Guideline for EV battery swapping		1,000				1,000
<b>Grand Total</b>	<b>400,000</b>	<b>1,000,000</b>	<b>135,000</b>	<b>79,986</b>	<b>161,498</b>	<b>1,776,484</b>

#### ANNEX F: (For NGI only) Termsheet

Instructions. Please submit an finalized termsheet in this section. The NGI Program Call for Proposals provided a template in Annex A of the Call for Proposals that can be used by the Agency. Agencies can use their own termsheets but must add

sections on Currency Risk, Co-financing Ratio and Financial Additionality as defined in the template provided in Annex A of the Call for proposals. Termsheets submitted at CEO endorsement stage should include final terms and conditions of the financing.

n/a

**ANNEX G: (For NGI only) Reflows**

Instructions. Please submit a reflows table as provided in Annex B of the NGI Program Call for Proposals and the Trustee excel sheet for reflows (as provided by the Secretariat or the Trustee) in the Document Section of the CEO endorsement. The Agency is required to quantify any expected financial return/gains/interests earned on non-grant instruments that will be transferred to the GEF Trust Fund as noted in the Guidelines on the Project and Program Cycle Policy. Partner Agencies will be required to comply with the reflows procedures established in their respective Financial Procedures Agreement with the GEF Trustee. Agencies are welcomed to provide assumptions that explain expected financial reflow schedules.

n/a

**ANNEX H: (For NGI only) Agency Capacity to generate reflows**

Instructions. The GEF Agency submitting the CEO endorsement request is required to respond to any questions raised as part of the PIF review process that required clarifications on the Agency Capacity to manage reflows. This Annex seeks to demonstrate Agencies' capacity and eligibility to administer NGI resources as established in the Guidelines on the Project and Program Cycle Policy, GEF/C.52/Inf.06/Rev.01, June 9, 2017 (Annex 5).

n/a